

SOUTHERN POWER AND INDUSTRY

Ad Index, page 162

MAY, 1951

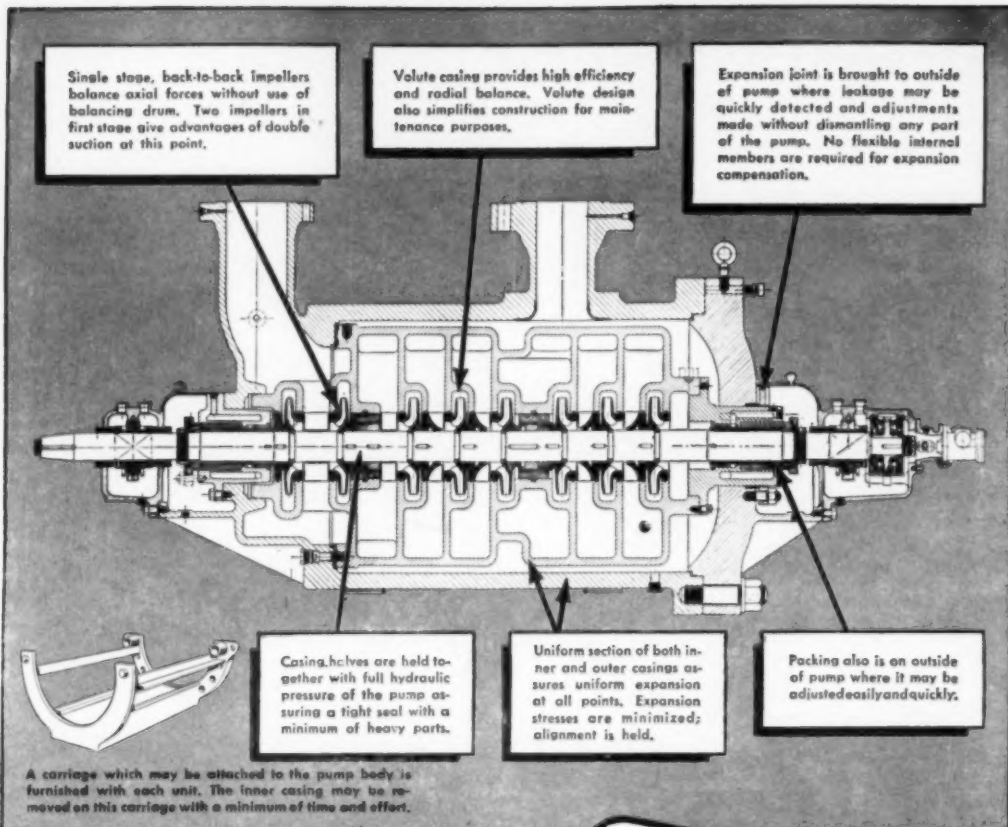
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Annual
Maintenance
Issue



Cost Cutting Features

HERE IS A PUMP designed to meet the needs of the newer high pressure boiler plants. Efficiency is high, maintenance is low and every design feature has a long record of successful application to boiler feed service.

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Volume 69

Number 5

TROUBLE

ISLAND

Photo is of a condenser-tube scale sample, about eight inches long. Solid scale is approximately $\frac{1}{8}$ -inch thick, with "spires" ranging up to $\frac{3}{8}$ -inch height.

FIFTEEN years ago, this small island of trouble was part of a much larger open-box condenser problem at a refinery. Cooling water, running over 200°F. at outlet, contained 30 grains per gallon hardness and 20 parts per million iron. Tubes scaled heavily and rapidly without chemical inhibitor. Even with the best inhibitor then known, results were as illustrated above: partial inhibiting action creating the "spires" or forest-like deposits on tubes.

Considering this a challenge, Nalco sent a Doctor of Physical Chemistry—an expert water technologist—to the refinery. His weeks of work on the spot led to basically different treatment with new chemicals which cleaned up the condenser and kept it clean. Further Nalco research and development of chemical inhibitors has since enabled cooling systems to operate without scale or corrosion with water hardnesses as high as 200 grains per gallon.

Point is this: neither Nalco nor anyone else had an answer to scaling in that condenser. Nalco put the necessary brains to practical use and got results . . . benefiting, in the long run, not only that particular refinery, but every user of cooling water.

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SOUTHERN POWER AND INDUSTRY

Vol. 37
No. 5

MAY
1951



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Associate Editor

Hunter Hughes
Regional Editor

M. M. Lyon
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J. A. Moody
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Business Representatives

E. L. Rogers, 299 Madison Ave.,
New York 17, N. Y.—Phone
Murray Hill 2-4959.

George Inherwood, 413 Alexander
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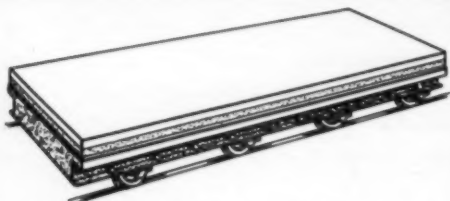
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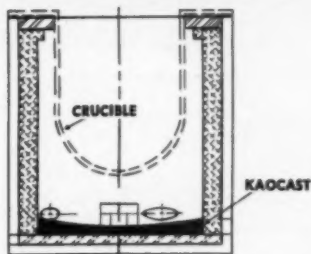
How you can profit with versatile **KAOCAST**



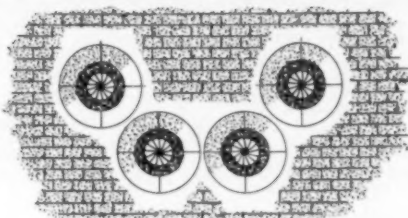
Used to line doors in 15-ton electric furnaces, KaoCast lasted three to four times as long as firebrick . . . cut overall costs in half.



KaoCast was used for car tops in a ceramic tunnel kiln 150' long. Ordinary fireclay castables crumbled in only a few trips and required continuous repair, but after 30 trips KaoCast showed no signs of deterioration.



In this magnesium-melting furnace the effect of molten metal previously necessitated replacement of the furnace bottom when the crucible was changed. This is no longer necessary with a lining of KaoCast because it stands up under the intermittent temperatures and has such high spalling resistance.



Burner openings in a marine boiler furnace were made of KaoCast. Inspection a year later showed them in such good condition that KaoCast was used for the same application on other ships of the line.

- Versatile KaoCast can be molded quickly and easily with your own labor. It can also be cast directly in place or applied by a cement gun.
- KaoCast eliminates an expensive inventory of special shapes. It speeds repairs and reduces costs.
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ume change and negligible reheat shrinkage.

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WRITE FOR BULLETIN R-22



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Facts and Trends

FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

May, 1951

MAINTENANCE IS BIG BUSINESS at Esso's Baton Rouge Refinery. \$750,000 in machine tools and equipment in a \$2,500,000 central mechanical maintenance building; controlled conditions, including air conditioning, humidity control and acoustical treatment; and top notch utilization of materials handling equipment resulted in a marked improvement in the efficiency of the huge refinery's mechanical maintenance department. A detailed semi-technical description is featured in this issue of SP&I.

WATER IS EXHAUSTIBLE and industrial requirements are frequently in excess of 300 lb of water per lb of finished product. Large users are power plants, manufacturers of paper, petroleum products, rayon, linen, textiles, sugar, hydrogen and steel. Hydrogen and synthetic rubber each require 2,500 lb of water per lb of finished product; wool requires 500 lb; butadiene 1200 lb; and steel, 250 lb.

With increased power demands and industries expanding their water needs, selection of economical water cooling equipment necessary for the industrial re-use of water is of vital importance. The "once-through" use of cooling water in industry is wasteful.

NEW HIGH-CONDUCTIVITY CONCRETE is expected to reduce the cost and expand the application of radiant heating. In the Products Planning Co. process, aggregates added to concrete increase the heat conductivity and also the wearing qualities. Higher heat-conductivity means a saving in pipe of from 25 to 30 per cent per installation. Aggregated concretes have withstood pressures of 4,200 psi. Various mixtures will be made available to meet severe traffic conditions in plant floors and for high-density traffic highway areas.

SMALL INDUSTRIAL PLANTS, which have no technical staffs or research facilities, can still bid on defense contracts which involve considerable product development provided they have access to a consulting laboratory. H. McKinley Conway, Jr., Director of the Southern Association of Science & Industry in Atlanta advises that several Richmond, Virginia firms have simply attached a brochure of a qualified research establishment to their bids to give evidence that they had access to suitable development agencies.

SASI's first Annual Directory of Southern Research covering 38 leading research groups was published in February. A portion of the directory was carried in the March issue of SP&I. A limited number of copies are still available from the Editors. Complimentary copies of the complete directory can be obtained on your letterhead request to the SASI group at 5009 Peachtree Rd., Atlanta, Georgia.

SHOP METALWORKING TRENDS as noted at the recent A.S.T.E. national technical program—"CONSTANT PRESSURE" LATHE, which can accurately determine how difficult or how easy a metal will be to machine in production, operates with a constant pressure feeding the tool into the work, supplied by a weight-and-pulley system. As carriage moves, cable pulling the carriage rings a bell with every .002" of carriage travel. Every time bell rings, operator records number of revolutions spindle has made. Feed is reported a more sensitive indicator of machinability than tool pressure.

Ordinary water in which extremely fine abrasive dust is suspended can be used for producing HIGH FINISHES on both metal and non-metallic products. In the Pangborn Corporation process, abrasives as fine as

talcum powder are used, suspended in a liquid (usually water and a corrosion preventive) which is driven against the part to be finished by high pressure air. Surface after liquid impact blasting is covered with microscopic "pockets." On working surfaces, these hold oil and improve operation of the part and its life.

Use of CONTINUOUS ABRASIVE BELTS for grinding is recommended as one means of cutting machine time on many parts. An 8-in. abrasive belt travelling at 5000 fpm flows 38,000,000 cutting grits over a metal part per minute. In addition, due to higher speeds on many jobs, abrasive-belt machines cost only a fraction of the machines they sometimes replace.

High speed steel tools are still most widely used in production but are rapidly being replaced by CARBIDES to cut production time and to conserve plant space, machines and manpower. Where carbides do not promise good results, try cast alloy tools before switching back to high-speed.

In older machine tools which cannot utilize the superior cutting properties of carbides, try the new grades of high-speed steel which contain ultra-hard carbides (vanadium carbide and molybdenum carbide particles). While average hardness of steel is much less than tungsten carbides, presence of hard particles enhances tool performance and life.

NEW CHEMICALS FOR WICHITA, KANSAS — Frontier Chemical Company's \$1,500,000 plant for chlorine production nearly completed . . . new \$800,000 Tennessee-Frontier Corporation expansion announced for benzene-hexachloride.

MORE LIGHT BULB PRODUCTION — Preliminary construction started on a \$2 million bulb and tubing operation of CORNING GLASS at DANVILLE, KENTUCKY . . . SYLVANIA ELECTRIC purchasing Continental Can Company's buildings at WHEELING, W. VA., to produce fluorescent lighting fixtures.

REPEAT BUSINESS FOR TENNESSEE by du Pont (as termed by the Tennessee Industrial Planning Newsletter) — new plants for MEMPHIS and COLUMBIA, plus units now operating at CHATTANOOGA and NASHVILLE give Tennessee a total of six du Pont plants, more than any other Southern state in which company operates . . . MEMPHIS operation, scheduled for completion in 1952, will be the South's first hydrogen peroxide plant (an important chemical for textile, paper and rubber industries). Plant will be adjacent to sodium cyanide unit noted several months ago . . . the COLUMBIA OPERATION of du Pont will be used for the manufacture of cellulose sponges.

NEWSPRINT FROM CANE WASTE — CLEWISTON, FLORIDA operation of The United Bagasse Cellulose Corp. planned for construction in near future, adjacent to the United States Sugar Corporation. 45,000 ton annual capacity plant scheduled to produce newsprint from sugar cane bagasse.

INDUSTRIAL ACTIVITY IN BRIEF — \$2 million expansion of UNION WIRE ROPE'S KANSAS CITY, MO. plant . . . ARMSTRONG CORK COMPANY'S \$1 million modernization and expansion program at PENSACOLA, FLORIDA . . . ALCOA building new \$55 million alumina plant at BAUXITE, ARKANSAS . . . \$4 million HARBISON WALKER REFRACTORIES plant at FAIRFIELD, ALABAMA . . . Current expansion by KIMBERLY-CLARK in MEMPHIS will boost mill's daily output to 200 tons, requiring 10 carloads daily of wood pulp and finishing supplies . . . new \$15 million ordnance division for THE WHELAND COMPANY in CHATTANOOGA . . . \$10 million graphite electrode plant of NATIONAL CARBIDE DIV. of Union Carbide & Carbon now well under way at COLUMBIA, TENNESSEE.

Write the editors for additional information on any of the above items.
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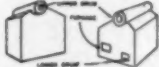
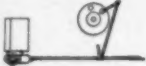
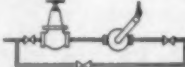



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RAPID LOAD SWINGS	Large diameter drums and ample furnace heating surface	

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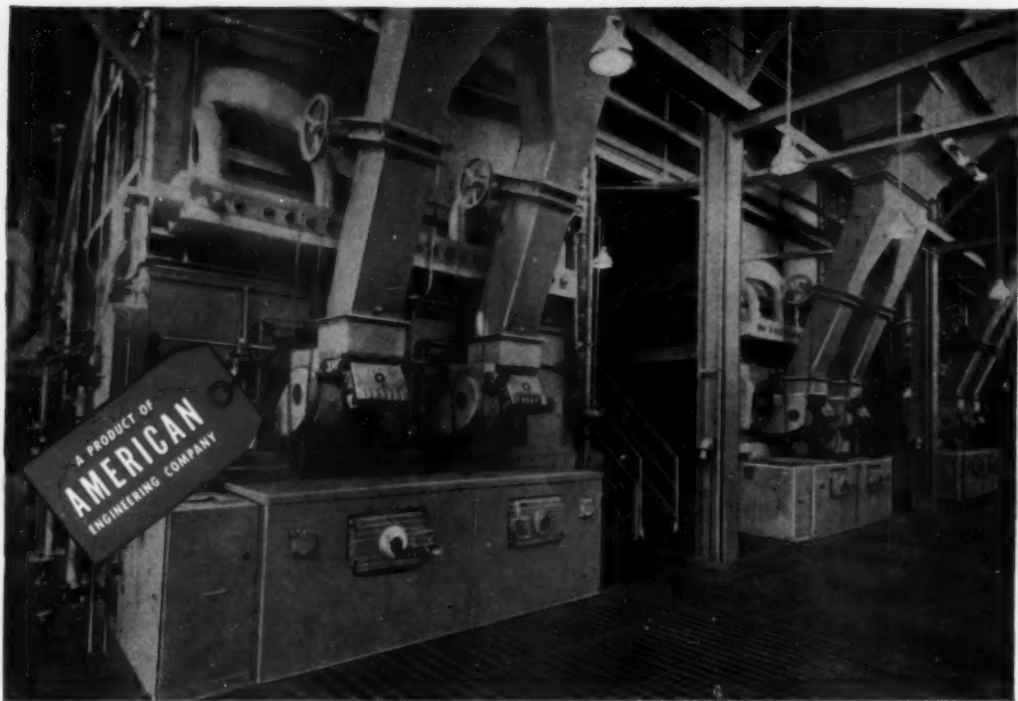
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Day and night, for weeks at a time, Spreader Stoker continuously releases 700,000 B.T.U. per hour per square foot of active grate area

1 IN THE FALL of 1949 a very well known corporation installed three AE Perfect Spread Stokers to generate 55,000 lbs. of steam per hour each in one of its midwest plants.

2 Months later the Company needed more steam from larger boilers in another plant where the existing stokers had been designed to burn 12,300 B.T.U. per pound coal. Over the years, however, the available coal dropped to as low as 9500 B.T.U. per pound so the plant could not carry the required load.

On the basis of proved performance, an AE Perfect Spread Stoker was installed as a replacement... and here's the record:

The Perfect Spread has averaged better than

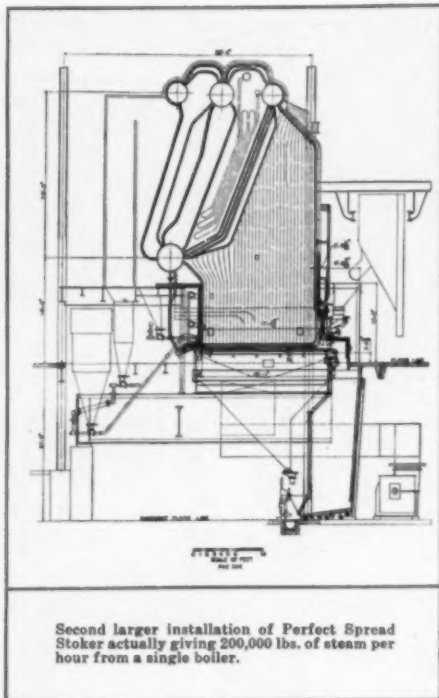
180,000 lbs. of steam per hour—24 hours a day—7 days a week for weeks on end. Efficiency is about 84% and the release rate exceeds 700,000 B.T.U. per sq. ft. of active grate area per hour! In terms of sustained results per sq. ft. of grate surface this is probably the highest duty spreader stoker installation in the world. With an increased manufacturing load they now find they can carry 200,000 lbs. per hour.

3 And now, again on the basis of performance, the same company has ordered two more duplicate Perfect Spread Stokers.*

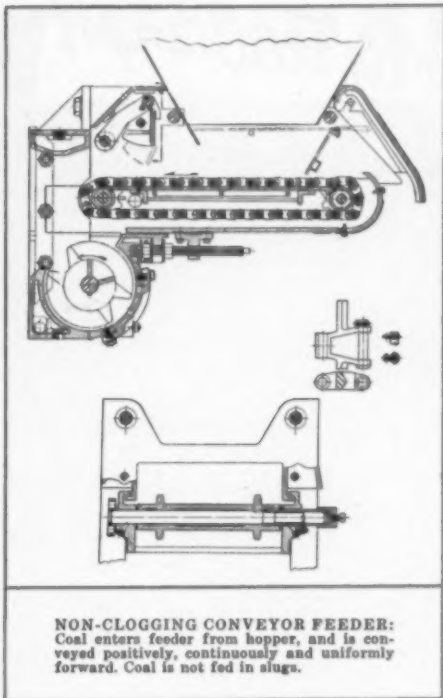
AE Perfect Spread Stokers burn high and low ash coals with practically equal efficiency. They assure positive, continuous coal feed and unbe-

*AS THIS MESSAGE WAS GOING TO PRESS, THE ABOVE COMPANY PLACED A FOURTH ORDER FOR A PERFECT SPREAD STOKER.

PERFECT SPREAD STOKERS



Second larger installation of Perfect Spread Stoker actually giving 200,000 lbs. of steam per hour from a single boiler.



NON-CLOGGING CONVEYOR FEEDER:
Coal enters feeder from hopper, and is conveyed positively, continuously and uniformly forward. Coal is not fed in slugs.

lieveably even distribution. *They never clog on wet coal.*

Perfect Spread Stokers have a capacity range from 8,000 to 500,000 lbs. of steam per hour... coal feeders are adjustable from 50 lbs. to 7500 lbs. of coal per hour. Mail coupon today for a

copy of the Perfect Spread Stoker booklet and for a reprint of a new report on large spreader stokers. Also, if you are now considering a boiler in capacities from 300,000 to 500,000 lbs. of steam per hour, let's arrange to get together and discuss cross-firing.

WON'T CLOG ON WET COAL



AMERICAN ENGINEERING

COMPANY

PHILADELPHIA 25, PENNA.

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Philadelphia 25, Penna.

Gentlemen: Kindly send me free copy of Perfect Spread Stoker booklet and new stoker report ☐. I should like to discuss cross-firing ☐.

Name _____ Title _____

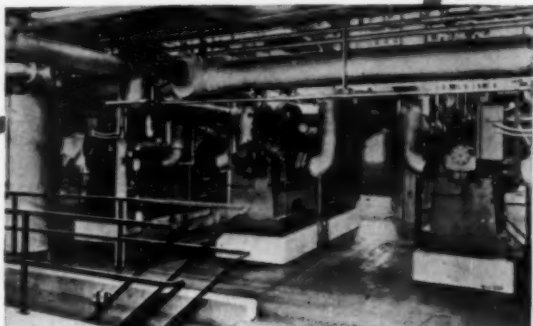
Company _____

Address _____

City _____ Zone _____ State _____

What Metals Are Best For Centrifugal Boiler Feed Pumps?

Drawing on their long experience in the field of hydraulics, Worthington engineers produce boiler feed pumps that are metallurgically correct in design, meeting every requirement as to temperature, pressure and corrosion-erosion resistance. As a result, Worthington boiler feed pumps perform better and last longer.



Three Worthington Azially Split Centrifugal Boiler Feed Pumps At The Kansas Power And Light Company Plant, Hutchinson, Kansas.

The following table represents Worthington's recommendation of materials:

Casting	Fittings	Maximum Temperature	Use
1. Cast Iron	Bronze	250 F	pH neutral to 8.5 pressures under 1000 psi unless water is known to have corrosive action.
2. Cast Iron	13% Chromium Stainless Steel	350 F	Any pH, but at pressures under 1000 psi unless water is known to have excessive corrosive action.
3. Carbon Steel	Bronze	250 F	Seldom used for boiler feed service—only where water is definitely known not to be corrosive.
4. Carbon Steel	13% Chromium Stainless Steel	400 F	pH above 8.5, and only where water is definitely known not to be corrosive.
5. 5% or higher Chromium Steel	13% Chromium Stainless Steel	Any temperature normally encountered	Any pH and where water is corrosive or previous trouble reported.

This proven selection of materials coupled with the most advanced design, superior workmanship and a thorough knowledge of application show why . . .

THERE'S A RIGHT WORTHINGTON PUMP FOR YOU

. . . right for the pressure and temperature of your boiler feed service . . . right for maximum economy and dependability. For further proof that *there's more worth in Worthington*, contact our nearest District Office, or write to *Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.*

One of Several Solid Barrel, Radially Split, High Pressure Boiler Feed Pumps at the Trenton Channel Station of the Detroit Edison Co.



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to 1500 GPM
Heads
to 1000 Ft.



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Chilled Water
Service**
Capacities
to 1400 GPM
Heads to 650 Feet



**For Boiler
Feed Service**
Capacities
to 1500 GPM
Heads
to 1600 Feet



**For Water Works,
Circulation,
Drainage,
General Service**
Capacities
to 135,000 GPM
Heads to 400 Feet



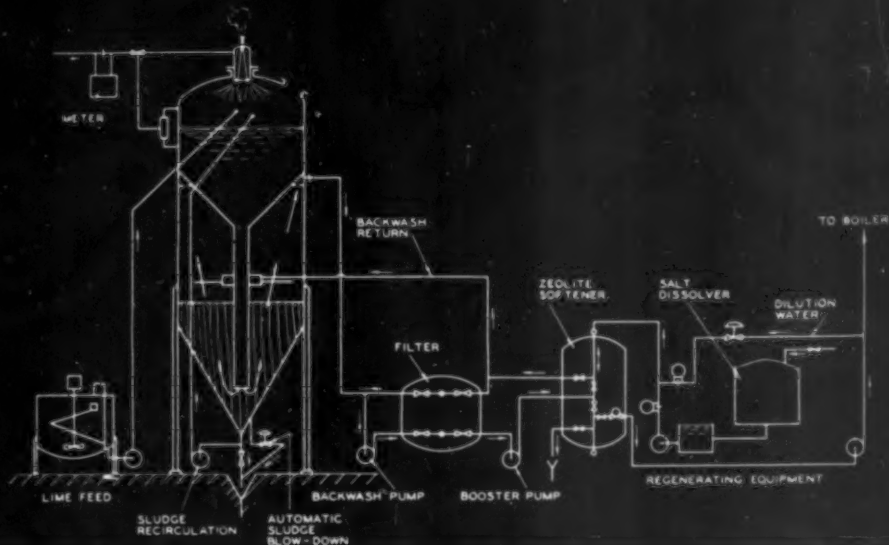
**For Boiler
Feed Service**
Capacities
to 1600 GPM
Heads
to 3500 Feet



**For Boiler
Feed Service**
Capacities
to 5000 GPM
Heads
to 7000 Feet



cochrane hot process zeolite water conditioner



1. saves chemicals

The zeolite softener uses salt instead of the more expensive soda ash and phosphates, bringing down the cost of chemicals considerably.

2. saves on capital investment

The cost of adding zeolite equipment to a hot process installation is far less than the addition of an independent sedimentation tank and chemical feed for a two-stage phosphate process.

3. lower CO₂ in steam

The lower alkalinity resulting from using lime alone, plus the fact that this alkalinity is all carbonate, causes a reduction in CO₂ generated in the steam.

4. less operating attention

The use of the zeolite softener with its simplicity of operation is an advantage which is enhanced by the longer periods between regenerations, due to the lower hardness of the hot process softener effluent.

5. less floor space and head room required

The addition of the zeolite equipment requires less floor space and less head room than that required for two stage phosphate equipment.

6. lower alkalinity

The use of lime (or Dolomitic lime) as the sole reagent in the hot process means that the alkalinity can be reduced to about half that obtained with lime and soda ash.

7. only one chemical needed in the hot process

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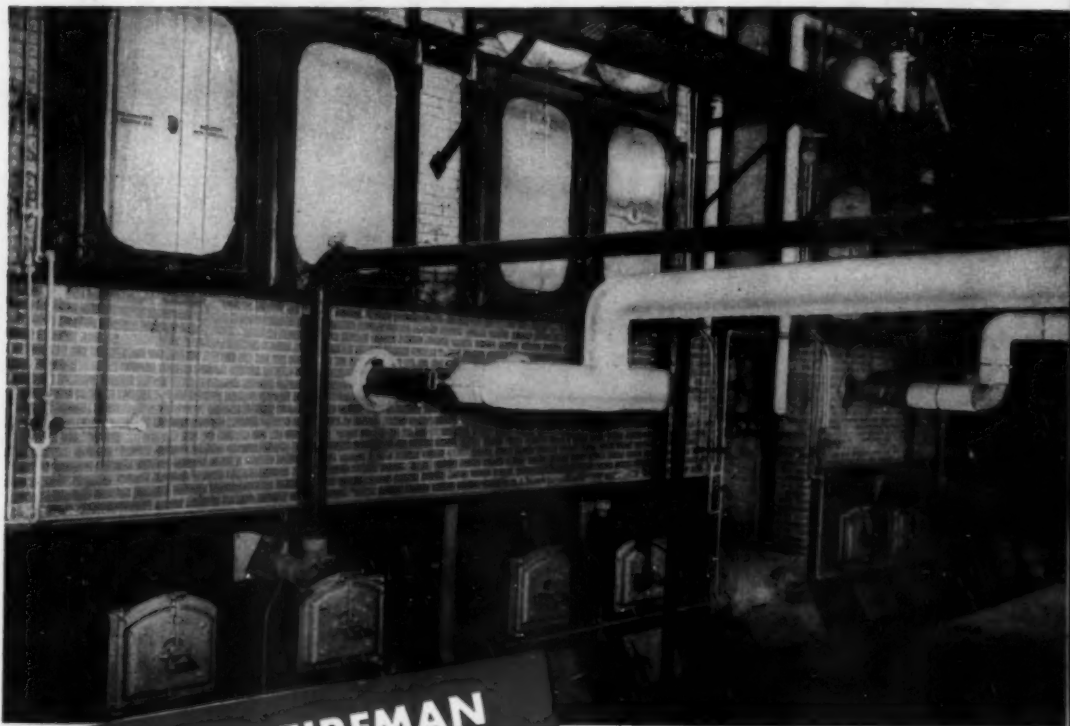
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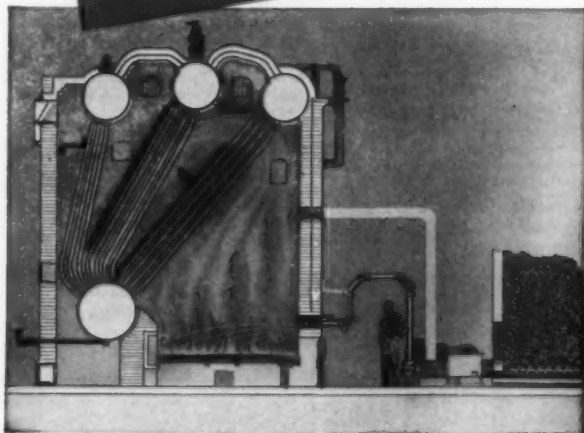
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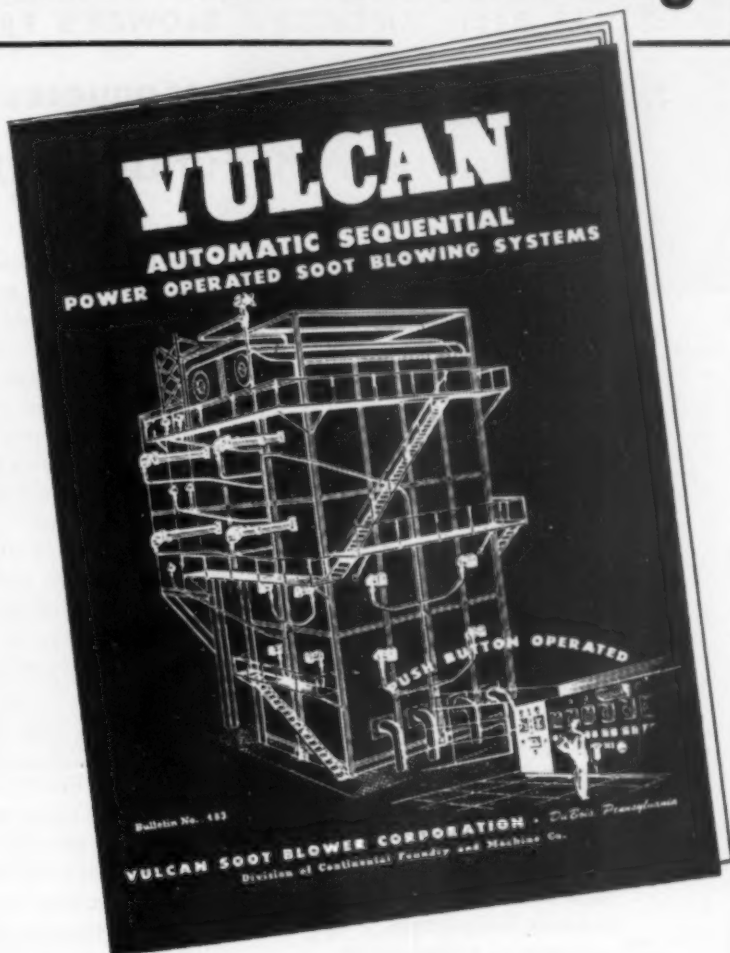


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AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

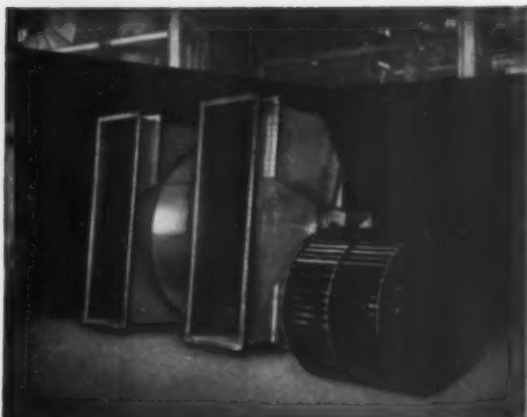
Mechanical Draft Fans

for

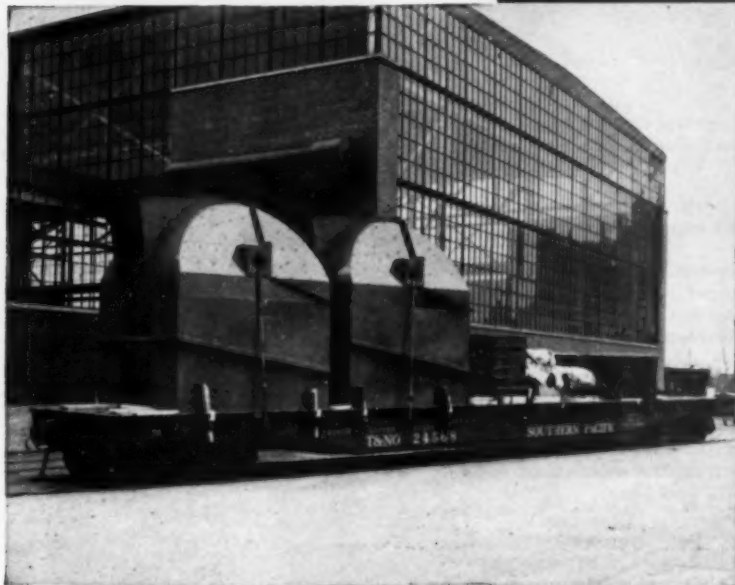
Potomac Electric Power Co.

Benning Station, Washington, D.C.

To supply the ever-increasing demand for electric power in the Washington, D.C. area, still another of America's great public utilities, Potomac Electric Power Co., is expanding and enlarging its facilities and services.



Above is shown one of 2 American Blower Forced Draft Fans ready to be loaded on a freight car for shipment to the Potomac Electric Power Co., Benning Station. Each fan will be equipped with louvre controls and outlet dampers. The capacity of each fan is 135,000 CFM at 100° F. at 15.8" SP.



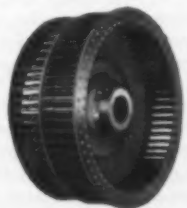
← The photograph at the left shows 2 American Blower Induced Draft Fans loaded on a freight car and ready for shipment.

These fans will be equipped with inlet and outlet dampers and each has a capacity of 171,000 CFM at 330° F. at 22.0" SP.

You'll find dependable American Blower Mechanical Draft Fans measure up to the most exacting power plant requirements. High static efficiency, low R.P.M., low tip speed and low inlet velocity are but a few of the many reasons these fans have found such wide acceptance with public utilities. For complete information, contact your nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICH.
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Divisions of AMERICAN RADIATOR & Standard Sanitary Corporation



The Sirocco Wheel

The unique and scientific design of the Sirocco wheel provides a structure of unusual strength, unobstructed for smooth air flow. The blades are die formed, assuring exact duplicates, and are machine riveted to the backplate and rim, so that each blade is set in the wheel at exactly the correct angle.

YOUR BEST BUY AMERICAN BLOWER POWER PLANT EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWAUNEE BOILERS • ROSS HEATER • TONAWANDA IRON

GRAVER

can eliminate
all these
impurities
from water...

Are any of these impurities causing plant shut-downs . . . equipment failures . . . high production costs?

Graver can eliminate any or all of these impurities from your water supply . . .

. . . because Graver manufactures *every type* of water treating equipment . . . hot and cold process softeners . . . cold and hot zeolite softeners . . . demineralizers . . . deaerating heaters . . . filters . . . chemical feeders . . . combination systems.

. . . because Graver brings complete research, laboratory, pilot plant, process development, equipment designing, manufacturing and erection facilities to bear on the solution of individual water-treatment problems.

. . . because Graver has a 40-year record of *pioneering* in the advance of water-treatment processes and the development and improvement of water-treating equipment.

. . . because Graver has many thousands of *successful installations* to prove the correctness of Graver recommendations and the effectiveness of Graver processes and equipment.

Graver provides authoritative advice on the most modern proven methods and designs for solving your particular water treating problem. Send sample of your raw water supply for *free analysis* and recommendations without obligation.



GRAVER WATER CONDITIONING CO.

Division of Graver Tank & Mfg. Co., Inc.

216 WEST 14TH STREET, NEW YORK 11, N. Y.

Chicago • Philadelphia • Cleveland

Mg⁺⁺

Ca⁺⁺

Na⁺

Fe⁺⁺

Fe⁺⁺⁺

Mn⁺⁺

SO₄⁻⁻

CO₃⁻⁻

HCO₃⁻

Cl⁻

SiO₂

CO₂

O₂

Turbidity

Color

Organic
Matter

REPEAT ORDERS
tell the story



Again CATERPILLAR TRACTOR CO. is getting additional Springfield Steam Generating Units—this time for the company's Tractor Plant at Joliet, Illinois. They add 160,000 lbs. of capacity to the four units previously installed in Peoria.

"Caterpillar" is one of the many leading American industrial organizations that have placed their seal of approval on Springfield with REPEAT ORDERS.* For Steam Generating Units that "are built to stay modern longer," check with Springfield now!

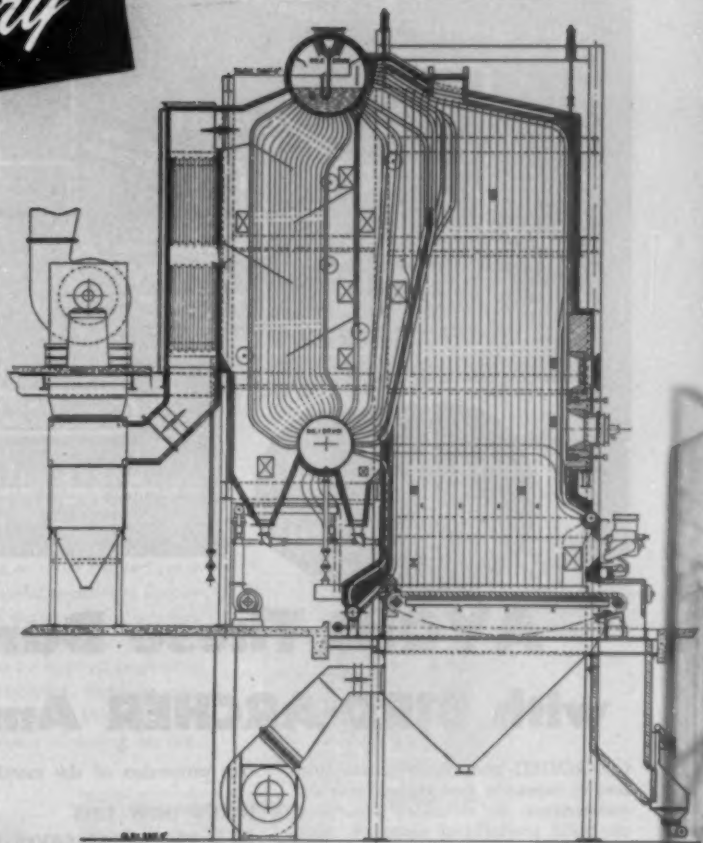
Springfield Boiler Co. specializes in the production of a complete range of steam generating equipment... ANY SIZE... ANY PRESSURE... ANY TEMPERATURE... AND FOR ANY FUEL. Springfield is organized to apply the same engineering skill to all contracts, large or small. We will be glad to submit a proposal covering your requirements.

*For a complete list, see your local Springfield Representative.

Check with Your
Consulting Engineer
on Modernization and
New Plant Projects



...of complete satisfaction!



2 New Springfield Units

The above drawing shows the arrangement of the two new Springfield units for the Joliet, Illinois, plant of Caterpillar Tractor Co.

UNIT CAPACITY—80,000 lbs. per hour, continuous; 90,000 lbs. per hour, two hour peak at 150 psig saturated.
DESIGN EFFICIENCY—82.85% at 80,000 lbs.; 82.2% at 90,000 lbs.

FIRING—American Engineering Co. Spreader Stokers. One unit equipped with auxiliary gas burners.

AUXILIARIES—Springfield Economizer, Dust Collector, Forced and Induced Draft Fans, Controls.

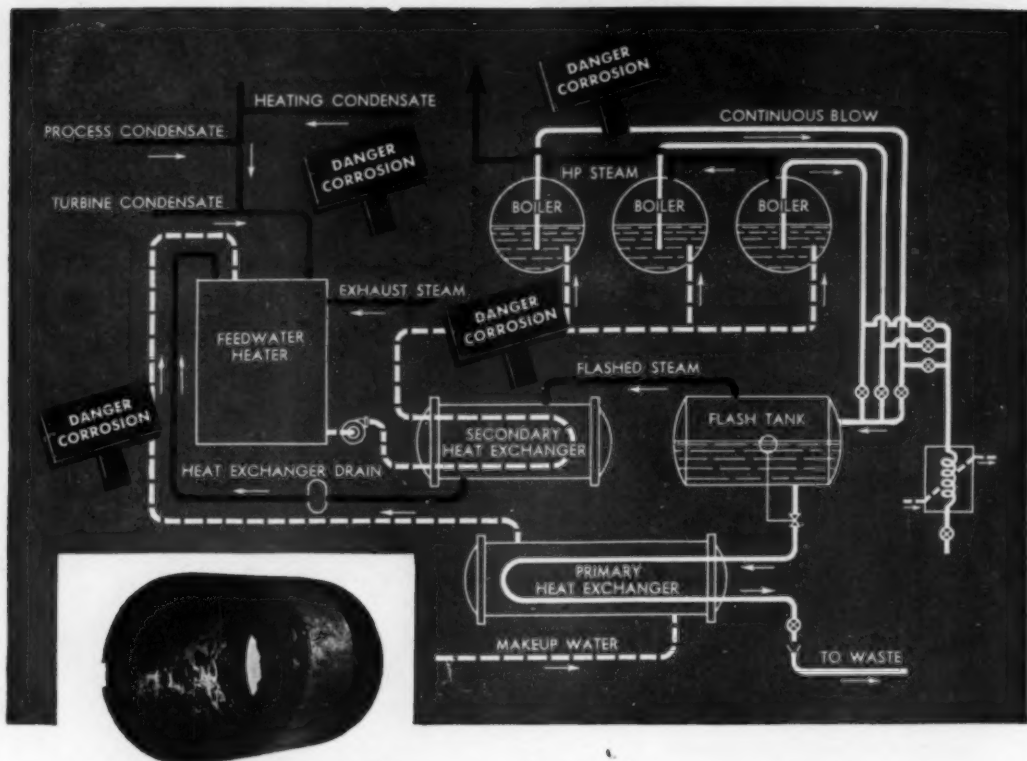
SPRINGFIELD BOILER CO.

1957 E. Capitol Ave., Springfield, Illinois, U. S. A.

Worldwide Sales and Service

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in SWEET'S

WENT TUBE BOILERS • STRAIGHT TUBE BOILERS • SUPERHEATERS • DESUPERHEATERS • AIR HEATERS
ECONOMIZERS • WATERWALLS • PACKAGE BOILERS • COMPLETE STEAM GENERATING UNITS



AVOID These Danger Signs with BIRD-ARCHER Amine Treatment

CORRODED condensate return lines lead to expensive pipe replacement and maintenance. As an added annoyance, the solid products of corrosion often plug return lines and fill traps. You can steer clear of these troubles by using the *effective, economical* Bird-Archer Amine Treatment.

HERE'S THE WAY THIS B-A TREATMENT WORKS

Amines are fed into the boiler or into the steam and condensate systems. The amines raise the pH value of the condensate and also tend to inhibit equipment-destroying corrosion through sur-

face protection of the metal itself.

HERE'S HOW THIS

B-A TREATMENT SAVES MONEY

Raising the pH value of the condensate severely decreases maintenance costs by eliminating corrosion. These savings may more than offset the amount of treatment required to provide protection for your equipment.

NEW BULLETIN gives full details on the Bird-Archer Amine Treatment. . . contains case histories that prove its successful application in many plants. *Write for your copy today.*

BA-124

WHAT AMINES ARE

Amines are members of a class of chemical compounds in which one or more hydrogen atoms of the ammonia molecule are substituted by an organic group. Some of the simpler types are soluble and volatilize from boiler waters. The alkalinity of the amines is an inherent property and does not result from decomposition. *No free ammonia is released.* In the concentrations necessary for protection of condensate systems, amines are harmless to non-ferrous metals, non-toxic and are completely stable at temperatures approximating 675°F.

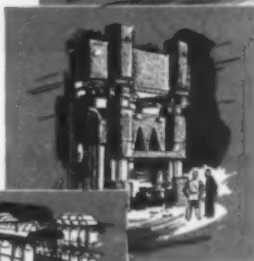
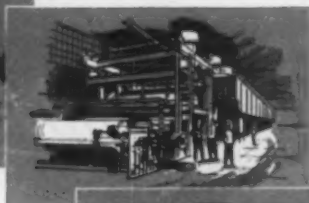
BIRD-ARCHER WATER TREATMENT



THE BIRD-ARCHER COMPANY, 4337 NORTH AMERICAN ST., PHILADELPHIA 40, PA.
NEW YORK • CHICAGO

IN CANADA: The Bird-Archer Co., Limited, 503 McGill Building, Montreal
IN MEXICO: Calderas y Accesorios, S. A., Amsterdam 291, Mexico, D. F.

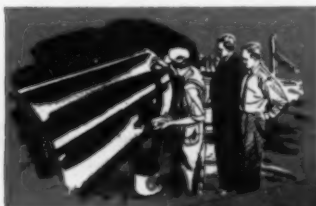
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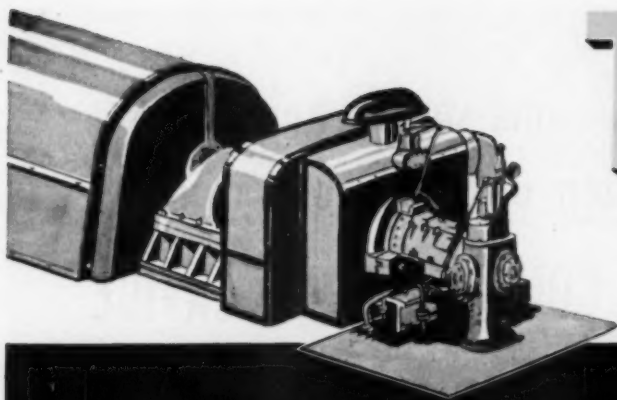
Please send me, without obligation, a copy of the booklet "Gulf Periodic Consultation Service."

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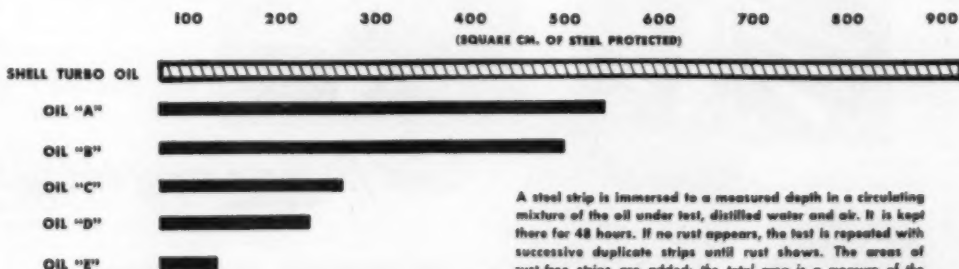


Today's

Improved SHELL TURBO OIL



"LOOK AT THESE RUST-PROTECTION FIGURES"



A steel strip is immersed to a measured depth in a circulating mixture of the oil under test, distilled water and air. It is kept there for 48 hours. If no rust appears, the test is repeated with successive duplicate strips until rust shows. The areas of rust-free strips are added; the total area is a measure of the oil's rust protection.

Improved SHELL TURBO OIL *for*

Surest Safeguard

for MAJOR TURBINE INVESTMENT

The one lubricant that provides this
outstanding 5-way protection

Because of the tremendous responsibility entrusted to operators of large steam turbines, and because of the heavy investment each unit represents, Shell Oil Company has been concentrating on a lubricant research project of primary

importance to utility and industrial executives.

The product now offered, Improved SHELL TURBO OIL, exceeds every accepted specification for premium turbine lubricants. It offers these five outstanding improvements:

- 1. Highest known rust protection**—An entirely new combination of rust inhibiting additives effectively retards the formation of rust—an action which with proper maintenance will continue for the life of the turbine. Rusting problems are reduced to the very minimum in any turbine protected by Improved Shell Turbo Oils.
- 2. Outstanding Oxidation Stability**—Improved Shell Turbo Oil contains the same time-proved anti-oxidant which has compiled such an extraordinary record of oxidation stability in the original Shell Turbo Oil. Service records for turbine units of all sizes . . . many operating for 10 to 13 years . . . show complete stability with respect to oxidation and sludge formation. In each of these units the oil gives every indication of matching the operating life of the turbine itself.
- 3. Anti-foaming**—With the effective anti-foam agent now in Shell Turbo Oil, air entrainment can be tolerated for considerable periods, thus avoiding unscheduled shutdown.
- 4. Excellent Emulsion Characteristics**—Improved Shell Turbo Oil provides the greatest protection against rust and oxidation yet achieved. Moreover, this protection is attained without any tendency to form objectionable water emulsions in service.
- 5. Protection against wear**—The specially developed rust inhibitor used in Improved Shell Turbo Oil has the added faculty of reducing surface wear . . . adding to the protection afforded by the Oil itself. Because of this "anti-wear" effect, Shell Turbo Oil provides a welcome margin of safety for the bearings and gears during the critical starting and stopping periods.

Samples and complete information on the Improved Shell Turbo Oil will be sent promptly on receipt of your letterhead request. Address:
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50th Street, New York 20, N.Y.
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central station and industrial turbines

is obsolete wiring

from this



the right cable for the job

reducing your power to this?



SURVEYS SAY, YES! Overloaded circuits and inadequate electrical equipment are stealing power and profits from 9 out of 10 industrial plants—a fact established by industrial surveys.

UTILIZE THE POWER YOU PAY FOR. Obsolete wiring systems cut down production . . . lose valuable man hours . . . and weaken the potent industrial power that is so vital to the strength of our national defense.

POWER UP AND BE PREPARED for greater production, lower costs and a stronger national defense. Call in your utility, consulting or plant power engineer or your electrical contractor. Find out the condition of your plant wiring system today and prevent a possible breakdown tomorrow.

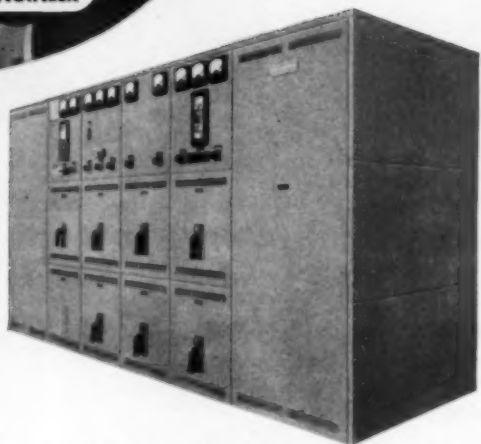
AND DON'T FORGET to send for your copy of "Power Up—And Be Prepared," a straight-to-the-point guide to wiring systems and maintenance. It helps you effectively survey your own wiring system. Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

61-0000



ANACONDA[®]
WIRE AND CABLE

WHICH MAN IS THE EXPEDITER?



Customer, sales engineer, production manager — all three have a direct influence on the speed with which a switchgear order can be produced and delivered.

But the customer can be most influential by far!

For if he is an experienced buyer, he selects standard arrangements as-

sembled from standard components — and in this way materially speeds engineering, order entry and production. Further, since standard construction evolves from expressed preferences based on the actual experience of thousands of users like himself, he obtains the best possible equipment at the lowest possible cost.

To speed your switchgear delivery

Let your I-T-E representative show you how standard components can be used for your requirements!



For more dependable Switchgear

specify I-T-E!



I-T-E Circuit Breaker Company • 19th & Hamilton Streets • Philadelphia 30, Pa.

Power Switching Equipment: Railway and Industrial Engineering Co., Greensburg, Pa.

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GENERAL OFFICES

Esso Standard Oil Company
of Louisiana, Baton Rouge

STANDARD OF LOUISIANA USES CLARAGE HEAVY-DUTY AIR CONDITIONING EQUIPMENT

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(Mechanical Services) New York City
CONTRACTOR: James F. O'Neil,
(Heating and Air Cond.) New Orleans

A notable addition to American Architecture . . . designed for the utmost in worker comfort and efficiency . . . is this new Esso office building described in the January issue of Architectural Record and March issue of Southern Power and Industry.

Here, as in so many other commercial and industrial buildings from coast to coast, Clarage HEAVY-DUTY equipment supplies complete air conditioning.

The engineers who specify Clarage equipment — and the contractors who install it — have done their level best to provide owners with long-time economy of operation. Our famous HEAVY-DUTY construction insures that!

CLARAGE

—HEADQUARTERS for Air Handling
and Conditioning Equipment



CLARAGE FAN COMPANY
KALAMAZOO, MICHIGAN

APPLICATION ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

This man...

**GIVES 1st AID
TO SICK
PLANTS!**



The plant doctor and first aid department look after sick or injured workers, but when a machine or department is threatened with "down time" medical science is helpless while production costs rapidly rise.

But there is a man you can phone, just as you would call the doctor, or the fire or police department, and he will get on the job just as quickly, supplying the parts, materials or knowledge needed.

Emergency cooperation is this man's specialty. He has at hand about every remedy a machine or factory could need for any kind of trouble. He has prepared himself to meet the special requirements of the plants in his locality. Just pick up the phone and call him.

Capable

"This man" is an industrial distributor* or a specialist in certain industrial items. You will find him listed in the classified section of your telephone book—most likely under the heading Bars, bronze or Bearings, bronze. If he is the leading distributor, he almost certainly is the Bunting Distributor. He carries in stock for your money saving convenience Bunting Standard Stock Industrial Bearings, Electric Motor Bearings, and Precision Bronze Bars—ask him for catalog.

*There are approximately 2,000 Industrial Distributors serving every industrial section of the United States. In 1948 their total sales were more than \$3,000,000,000. They carry an average inventory of \$500,000,000, turn their stocks 5 to 6 times per year, fill 200,000 orders per day, have 12,000 outside salesmen and engineers, 10,000 inside telephone order expeditors, operate 8000 trucks delivering merchandise on which their average net profit is .0292 cents per dollar of sales.



Bunting®

BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

THE BUNTING BRASS & BRONZE CO., TOLEDO 9, OHIO

GROWING WITH THE INDUSTRIAL SOUTH

100,000,000
CUBIC FT.
PER DAY

1930

170,000,000
CUBIC FT. PER DAY

1940

550,000,000 CUBIC FEET PER DAY

1951

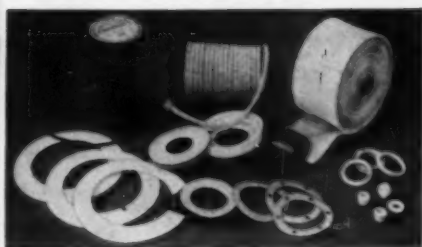


SOUTHERN NATURAL GAS COMPANY
WATTS BUILDING BIRMINGHAM, ALABAMA

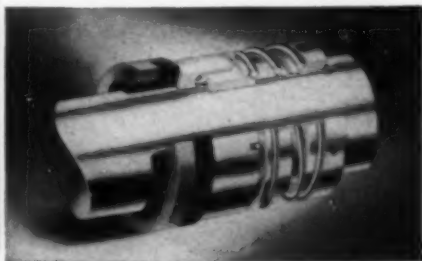
New and Improved

Packings, Gaskets and Seals

—from our expanded research program



Garlock Packings and Gaskets made of Teflon



Garlock Mechanical Seals for Rotary Shafts



Garlock Kloture® Oil Seal



Research has brought advanced design, better materials and new uses for thousands of products in American industry.

Here in the completely equipped Garlock research laboratories we have developed new products and have improved our regular line of packings, gaskets and seals with new materials and better designs.

These new and improved Garlock products will give you superior performance and long, economical service—will help you keep down operating costs.

Write for folders!

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK

In Canada: The Garlock Packing Company
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*Reg. U. S. Pat. Off.



Garlock

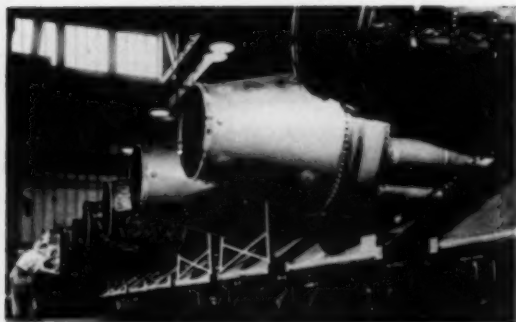


FRED A. HOFMANN, production vice president of the Elastic Stop Nut Corporation of America, says, "We're back on a full 2-shift production schedule, and practically every one of the 62 Tri-Clad motors we've installed since 1941 in our plant at Union,

N. J., is going night and day. Sure, we make a lot of steel products. But for a general-purpose motor, we don't think you can beat cast iron. After the pounding we've given our Tri-Clad motors for the past 10 years, we're stronger than ever for Tri-Clads."

ELASTIC STOP NUT CORPORATION:

"We're stronger than ever for Tri-Clad triple protection!"

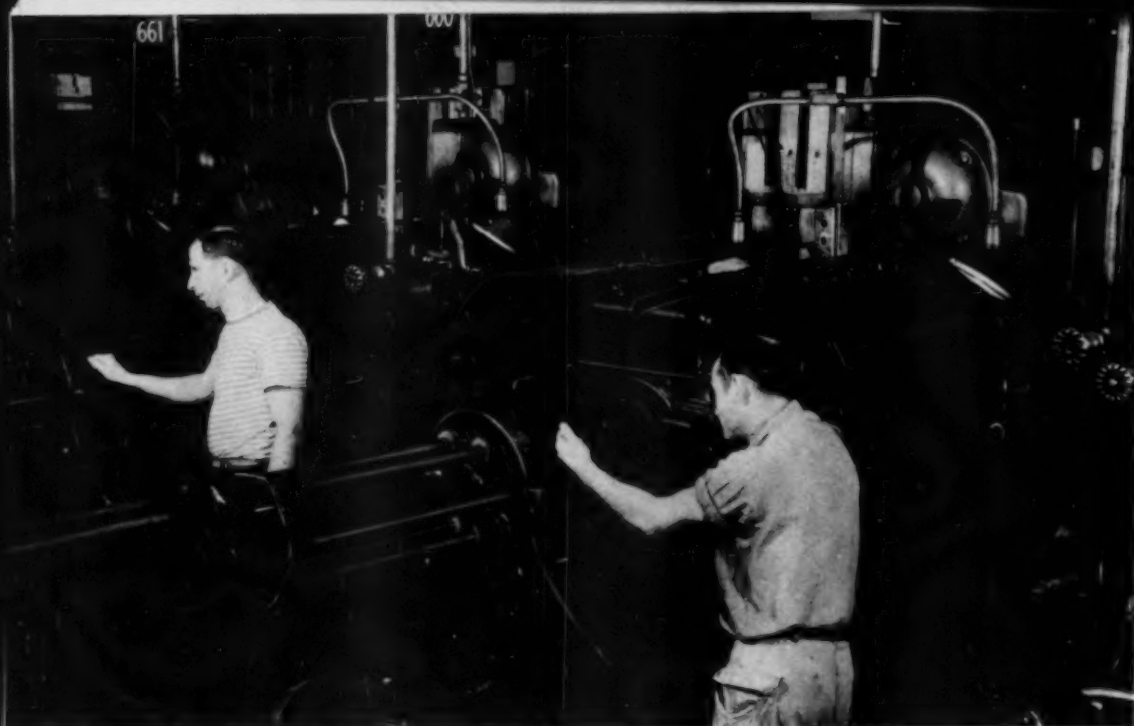


TRI-CLAD MOTORS drive machines that produce ESNA fasteners for use on jet aircraft engines—the engines that power our modern military planes. Each of the jet engines above uses a large number of these special stainless-steel high-temperature nuts, designed to hold under the extreme heat and other severe conditions of jet-engine operation. Moreover, these nuts must be re-usable without seizing or galling the finish. ESNA counts on the reliability of their Tri-Clads to help turn out thousands of these fasteners every day.



VIRILE VETERAN. This 10-hp Tri-Clad motor has been driving an Acme Gridley multiple spindle bar machine for nearly 10 years. It's still going strong, another reason why, after 10 years, ESNA thinks Tri-Clad is still their best motor buy! And today's Tri-Clad motor, all-industry favorite, is better than ever! ➡

GENERAL  **ELECTRIC**



4 STEPS—AND NO HANDS! Backbone of the ESNA production line, the Acme Gridley automatic bar machine (3 shown above) ejects a finished nut blank every $4\frac{1}{2}$ seconds. The operator simply keeps the six spindles supplied with bar stock. The machine feeds stock machines the nut profile, drills 2 holes and cuts off to ac-

curate lengths. The load on the 10-hp drive motor is heavy and constant—but Tri-Clad, with its bearings completely enclosed in cast-iron housings, can take it! Maintenance department can't recall a single Tri-Clad bearing ever having to be replaced. Moreover, if they need it, the motors are easily geared while running.



TRI/CLAD MOTORS
REG. U.S. PAT. OFF.

**Help Keep ESNA
Production Up!**

PRODUCTION PUSHER General plant foreman Karl Kjellburg has the job of meeting "impossible" defense program manufacturing schedules. He's counting heavily on automatically fed machines like the Tri-Clad driven V. & O. press on his left, says, "This press inserts over 200 elastic fibre locking collars a minute in a $\frac{3}{8}$ " fastener. Driving it is a big job for a motor. Our Tri-Clads gave us no trouble during the war. We're counting on them again!"





TROUBLE SHOOTER TESTIFIES Ed Conk, ESNA's maintenance chief, must furnish reliable power wherever it's needed in the plant. He's got some definite ideas about electric motors; says, "We like a motor you can regrease easily if you have to. So far, we've had to regrease very few of our Tri-Clad motors. And those were either on hot spots or on particularly tough jobs. The point is—we could readily have regreased them all if it was necessary."



TOUGHEST... on the inside Extra protection against electrical breakdown is built into every Tri-Clad motor. Formex® wire windings, one-piece cast-aluminum rotor, double-end ventilation—these are features that prolong a general purpose motor's useful life.

TOUGHEST... on the outside Teeth rattling blows, dripping liquids, corrosive fumes—they're all in a day's work for Tri-Clad cast-iron construction. You get a rigid structure, too—one that won't twist out of line when you're bolting it down.

TOUGHEST... at the bearings A Tri-Clad motor will run safely without relubrication for as long as any general purpose motor you can buy. But, if the application does make relubrication a "must", you can grease your Tri-Clad without halting production.

* Reg. U.S. Pat. Off.

How to Keep Your Motors in Shape for the Job Ahead!



TIMELY READING With every electric motor needed on the line, once again it's time to be a crank about motor care. That's why every motor user needs this General Electric manual. Tells how to spot motor and generator trouble before it happens, how to prevent serious breakdown, how to conduct a regular motor maintenance program. Order a copy for your maintenance department today! Use the coupon!

General Electric Company

Section 732-B

Schenectady 5, New York

Please send me my free copy of "How To Maintain Motors and Generators" (GET-1202)

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Company _____

Address _____

City _____

State _____

GENERAL  ELECTRIC

Turn the page for the latest news on motor selection and application. ➡

NEED HELP IN TRAINING MANPOWER?

Here's a Valuable Tool!
—G-E's New Course on

MOTOR SELECTION AND APPLICATION

9 Slide Films and Accompanying Manuals
To Help You Get the Most Out of Electric Motors

Timed to help meet the growing demand for skilled industrial workers, this new General Electric Motor Selection and Application Course is a boon to everyone concerned with technical training problems. Here, in 9 short, easily understood lessons, is a "how-to" course that offers a broad introduction and review of motor principles and uses to engineers, plant personnel, students and all others concerned with motors. *It's a valuable production-boosting tool for any type plant!* Ask your G-E representative for more details on this course or mail the coupon today.



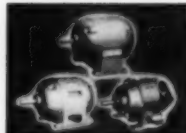
HERE'S WHAT THIS COURSE CONSISTS OF:

9 Sound slide films and records. 9 Sets of Review Booklets (10 per set) for student use. 1 Instructor's Manual—(This 96-page manual is virtually a complete course in itself.) Complete kit—Slide films, Review Booklets, and Instructor's Manual, in sturdy carrying case—\$100.00.

Here's a Quick Look at the Scope of the Course



Lesson 1—"Fundamentals of Motors"—Basic principles of motor operation, how a-c and d-c motors work, construction features, etc.



Lesson 2—"Types of Motors"—Horsepower, speed and torque and other characteristics, ranges of application, design features.



Lesson 3—"Fundamentals of Selection"—A study of the five basic steps that are usually followed in the selecting of any motor.



Lesson 4—"A-C Polyphase Induction Motors"—Characteristics of the three basic types: squirrel-cage, wound-rotor, adjustable-speed induction.



Lesson 5—"Single-Phase Integral-HP Motors"—General range of applications, torque and safety factor, capacitor and repulsion-induction types.

MAIL THE COUPON TODAY!

General Electric Company
Section 684-20
Schenectady 5, N. Y.

(Attach this coupon to your business letterhead and mail today)

Gentlemen:

Your Motor Selection and Application Course sounds like it may be valuable in our training program.

- ☐ Send me a complimentary copy of the Course Manual, GEZ-310, for my inspection, at no cost to me.
- ☐ Send us a complete course for a 10-day free trial. If we do not return the course at the end of the trial period, you are to bill us \$100.00 for this complete course.

Name _____
Company _____
Address _____
City _____ State _____



Lesson 6—"D-C Motors"—Basic types: shunt, series, compound; horsepower formulas, adjustable speed applications, versatility, etc.



Lesson 7—"Synchronous Motors"—Where used, design features, power factor improvement, and other basic operating benefits.



Lesson 8—"Adjustable-speed Drives"—Speed range and versatility of various packaged adjustable-speed drives, typical applications.



Lesson 9—"Gear Motors"—Selection and application of the three classes of gear units. Advantages of these low-speed drives.

GENERAL  ELECTRIC

684-20

A user **REPORTS...**

After their satisfactory experience with the 500,000 C. M. insulated aluminum cable (at right), National Supply Co., Torrance, Cal., says, "We will seriously consider aluminum when similar installations are planned." These cables, insulated with RH 600 v. U. S. Paracore, are connected to bus, from which they carry current to distribution panels for such heavy loads as welding machines, shears, rolls and other equipment.

figure it in ALUMINUM and you figure it low

When you plan new production lines, add feeders for heavier loads, get prices both ways—in aluminum and in copper. You'll find you can make worth-while savings with aluminum . . . and installation is faster, easier because of aluminum's light weight.

Although the rearmament program restricts the use of aluminum, we are ready to help you with the planning for trouble-free, low-cost wiring.



FREE INSTALLATION BOOK

"Questions and Answers" on installation of aluminum conductors. Write for it now — ALUMINUM COMPANY OF AMERICA, 1773E Gulf Bldg., Pittsburgh 19, Penna.



Aluminum Conductors



of ALCOA ^{EC} ALUMINUM are made by leading manufacturers



Boiler Water Indication



**AT THE
BOILER
DRUM**

YARWAY FLOATLESS HI-
LO ALARM WATER
COLUMN with VERTICAL
PRESSURE-SEALED FLAT
GLASS GAUGES. Glass
gauges have patented
"floating assembly" that
reduces glass breakage
and leakage. See Bulletin
WG-1811.

YARWAY
TAMMALL, PHILADELPHIA, PA.
PATENT APPLIED FOR

YARWAY

ON THE LEVEL with a Yarway System

It's accurate! It's where you can see it!

These two most important needs for boiler water level indication are assured with a Yarway system.

Yarway indicating equipment is accurate because it is operated *directly by the boiler water itself*. Yarway Weight-operated HI-Lo Alarm Water Columns with either Secure Inclined or Flat Glass Vertical Gages take care of the job at the boiler drum. On the instrument panel or other desired location, Yarway Remote Liquid Level Indicators bring over-

head gage readings down to convenient, easy eye-level vision. By use of a Control Unit on the indicator, additional HI-Lo light or sound alarms can be located at any place in the plant.

The Yarway HI-LO-GRAPH, a panel-mounted recording indicator, gives a 24-hour record of boiler water levels.

Yarway engineers will gladly show you how the Yarway Boiler Water Indicating System increases power plant safety and efficiency.

For the full story on Yarway Indicators, write for a free copy of Yarway Bulletin WG-1822.

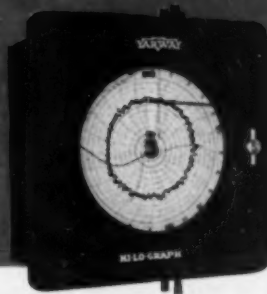
YARNALL-WARING COMPANY, Home Office: 116 Mermaid Ave., Philadelphia 18, Pa.

Southern Representative: ROGER A. MARTIN, Bann Allen Building, Atlanta 3, Ga.

ON THE INSTRUMENT PANEL

YARWAY REMOTE LIQUID LEVEL INDICATOR, operated directly by the boiler water itself, by the pressure differential between a constant head and the varying head in the boiler drum. Indicating mechanism is never under pressure—no stuffing boxes. See Bulletin WG-1822.

YARWAY HI-LO-GRAPH RECORDER provides not only instant indication but also 24-hour recording of boiler water levels. See Bulletin WG-1822.

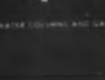
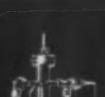


ANYWHERE IN THE PLANT

YARWAY REMOTE HI-LO ALARM SIGNALS, light or horn. Operated by Control Unit attached to Remote Liquid Level Indicator or Recorder. Any number can be installed, at any desired location throughout the plant. See Bulletin WG-1822.



STEAM PLANT EQUIPMENT



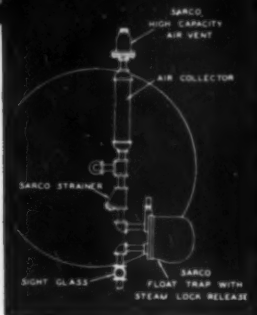


15 Cylinder Drying Machine, Eclipse Piece Dye Works, Passaic, N. J.

SARCO

INCREASED CLOTH DRYING PRODUCTION 10 to 15%

The Sarco System is a packaged unit—ready to install and made up of time tested, Sarco elements which have given satisfactory service for years.



An investment of less than 1% of the original cost of this 15 cylinder drying machine increased its production 10 to 15% — with the Sarco Drainage System. Because all condensate and air are removed continuously, all parts of every cylinder are always hot. No air binding — no water logging — no steam locking; and you get a dollar's worth of usable heat from every dollar's worth of fuel you buy.

Warm-up time is also greatly reduced. In one plant, 2½ hours are saved every time the machine is started up — in this case a dozen times a week.

This is only one of the ways Sarco Saves in textile plants. Elimination of condensate and air, and temperature controls are working wonders. For instance, Sarco experience in using hot condensate for other purposes may save thousands of dollars in your plant.

Sarco products also include self-operated and electric controls for all wet process operations. Write for the catalogs.

SARCO

SAVES STEAM

SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

IMPROVES PRODUCT QUALITY AND OUTPUT

TERRY



LARGE BLADE CLEARANCES GIVE ADDED DEPENDABILITY

Terry Turbine blades have the protection of generous radial and axial clearances. Axial clearance is so large—a full inch—that end play can do no damage.

Projecting rims at both sides of the wheel give further protection to the rotor buckets. Should clearance become reduced, these rims will take rubbing without damage to the blades.

This construction also makes frequent inspection of thrust bearings unnecessary.

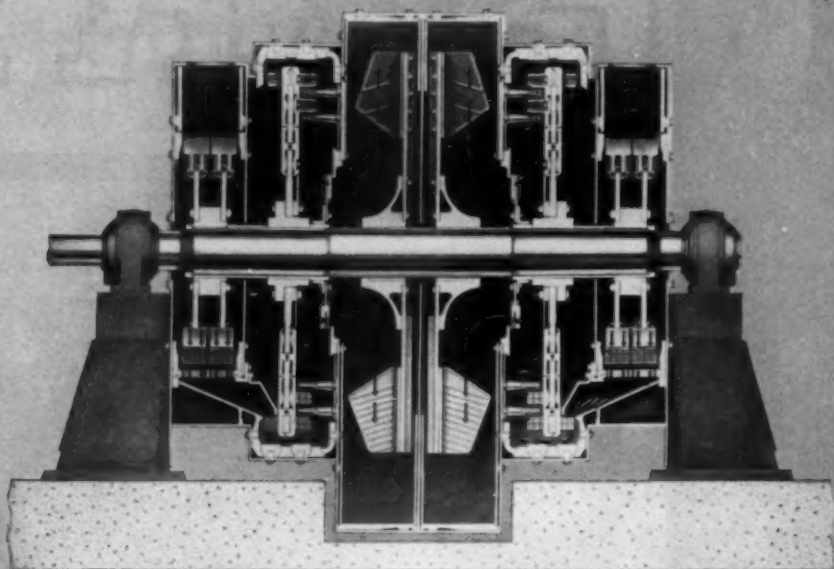
A request on your business letterhead will bring you Terry Bulletin S-116 giving detailed information about these features and other Terry Turbine advantages.

If you have a specific turbine drive job in mind, our district Terry representative will be glad to discuss it with you.

T-1174

**THE TERRY STEAM
TURBINE COMPANY**
TERRY SQUARE, HARTFORD, CONN.

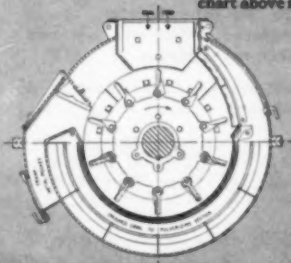
The NEW "50" Series Riley Pulverizer



Pulverizing parts faced with Tungsten Carbide **Long periods continuous operation** **Low maintenance . . . Sustained fineness**

Development of the use of tungsten carbide faced pulverizer parts was started by Riley over ten years ago. Hundreds of existing Riley pulverizers have been equipped. The use of tungsten carbide adds tremendously to the life of the parts. While Riley pulverizers have been in operation for over two years and have pulverized in excess of 50,000 tons of coal, wear of the tungsten carbide is scarcely measurable. These parts are good for many more years of service.

The use of tungsten carbide not only assures long continuous periods of operation without maintenance shutdowns, but because of the extremely long life, greatly reduces maintenance cost per ton of coal pulverized. Fineness of pulverization is sustained without any adjustments whatsoever. You will note from the chart above no reduction in fineness though practically 50,000 tons of coal have been pulverized.



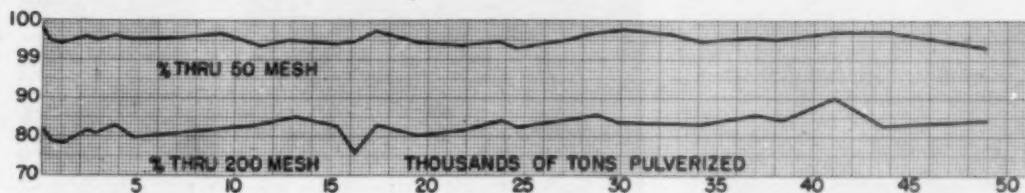
Preliminary Crusher-Dryer Section **No capacity reduction with high moisture coals** **Complete reliability**

Provided air or furnace gas of sufficient temperature is supplied, there is no capacity reduction with increased moisture content of the coal. The crusher section acts as a flash dryer. In this section coal is crushed to a fine granular state, approximately 40% through a 50-mesh screen, representing about 5% of the work to be done. Coal enters the pulverizing section where 95% of the work is done, with free moisture evaporated from the coal, consequently moisture content of the coal entering the crusher section has no effect on pulverizer capacity.

The crusher section of the pulverizer rejects tramp iron, iron pyrites and other hard foreign substance in the coal, preventing any materials from entering the pulverizer section which could cause damage.

RILEY STOKER CORPORATION
WORCESTER, MASS.
BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • FLUE GAS SCRUBBERS

a most significant Pulverizer Development



Other Operating Advantages

in addition to long life, low maintenance,
sustained fineness of pulverization . . .
no capacity reduction with high mois-
ture coals and complete reliability



Flexibility—Wide Load Range

As change in coal feed gives instantaneous corresponding change in pulverized coal output—there is no lag—rapidly and widely fluctuating loads are efficiently and easily carried.

Ability to Carry Low Loads

With the combination of Riley pulverizers and burners, extremely low loads with stable ignition can be maintained. It is not unusual for load ranges of 10 to 1 or for loads under 5000 pounds of steam per hour to be carried at Riley installations.

High Primary Air Temperatures

There is no necessity of limiting primary air temperatures as a precaution against fire or explosion or because of lubricating problems. Expensive control equipment limiting primary air temperatures is not required.

Ease of Lighting

Because of small percentage of primary air, a rich and readily lighted mixture of air and coal is obtained which together with the uniform distribution with Riley burners makes lighting easy and gives stable flame at low loads.

Quiet, Vibrationless Operation

There is no comparison between Riley pulverizers and other makes insofar as quiet vibrationless operation is concerned. You hear nothing more than a motor hum.

Small Space Required—Minimum Foundations

Riley pulverizers require less space per unit of capacity. Massive deep foundations are not required due to their vibrationless quiet operation.

Explosion Proof

There has never been an explosion in a Riley pulverizer. The velocity of coal travel through the pulverizer is faster than the rate of flame propagation, eliminating the possibility of an explosion.

Here is what one user has to say about his Riley pulverizers after equipping them with tungsten carbide parts:

Pleased to advise that in my opinion Riley Mills with carbide elements will outperform any mill today. Original parts installed Sept. 1948 are still going strong and fineness does not go below 80% through 200 mesh. Fully expect mill maintenance cost will run less than three cents per ton.

These companies have recently ordered new "50" Series Riley Pulverizers

MONSIEUR POWER COMPANY
Albright, W. Va.
IOWA-ILLINOIS GAS & ELECTRIC CO.
Davenport, Iowa
UTAH POWER & LIGHT CO.
Salt Lake City, Utah
SUPERIOR WATER, LIGHT & POWER CO.
Superior, Wisc.
WESTERN ELECTRIC CO.
Chicago, Ill.
CARNEGIE ILLINOIS STEEL CO.
Youngstown, Ohio
CELANESE CORP. OF AMERICA
Rock Hill, S. C.
PITTSBURGH PLATE GLASS CO.
New Martinsville, W. Va.
HOOKER ELECTROCHEMICAL CO.
Niagara Falls, N. Y.
U. S. FISHING CO.
Norwich, Conn.
SYRACUSE UNIVERSITY
Syracuse, N. Y.
REBEL TEXTILE CORP.
Tifton, Ga.
CITY OF AUSTIN
Austin, Minn.
CIRA STATES LTD.
Toms River, N. J.
BELL AIRCRAFT CORP.
Niagara Falls, N. Y.
POTOMAC LIGHT AND POWER CO.
Aldright, West Va.
NORTHERN PAPER MILLS
Green Bay, Wisc.

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in power costs

COMPLETE STEAM GENERATING UNITS

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

B-L TUBE-SUPPORTED WALLS ELIMINATE STEEL

Tube-supported wall enclosures for boilers—developed and first used in 1942 by Bigelow-Liptak—eliminate supporting steel, yet provide all the advantages of unit-suspended enclosures.

All components—castings, refractories, insulation and casing—are supported by boiler tubes. Each tile is held individually and can easily be replaced. Cumulative refractory loadings and expansion are not possible, and heat losses and air infiltration are minimized.

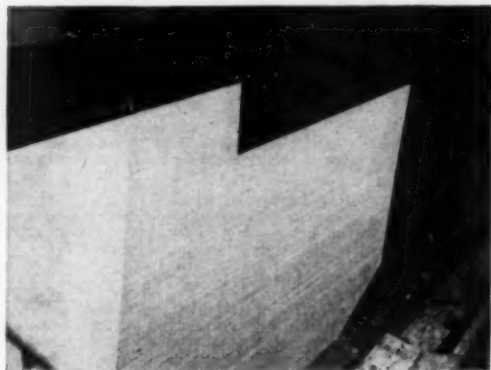
Tube-supported walls reduce the initial cost. Not only is structural steel eliminated, but thinner refractories and economical insulation thicknesses are employed. Steel plate casings are not needed with B-L's new Texad® finish.



Construction sequence is shown in this retouched photo. Supporting castings are fastened to studs which are field welded to the tubes. Block insulation, sandwiched between layers of plastic, seals the job. Metal lath and insulation battens hold the block in place. Weatherproof Texad® provides the finish.



The crew is now fastening to the retainers the castings and refractories. After the insulation has been applied...



... Texad® covers the enclosure. The job goes up quickly, costs less, saves steel, holds maintenance to a minimum.

Reserve your copy of B-L's new tube-supported wall catalog. Write today on your letterhead.

BIGELOW-LIPTAK

Unit-Suspended Walls + Arches

CURTIS BUILDING • DETROIT 2, MICHIGAN

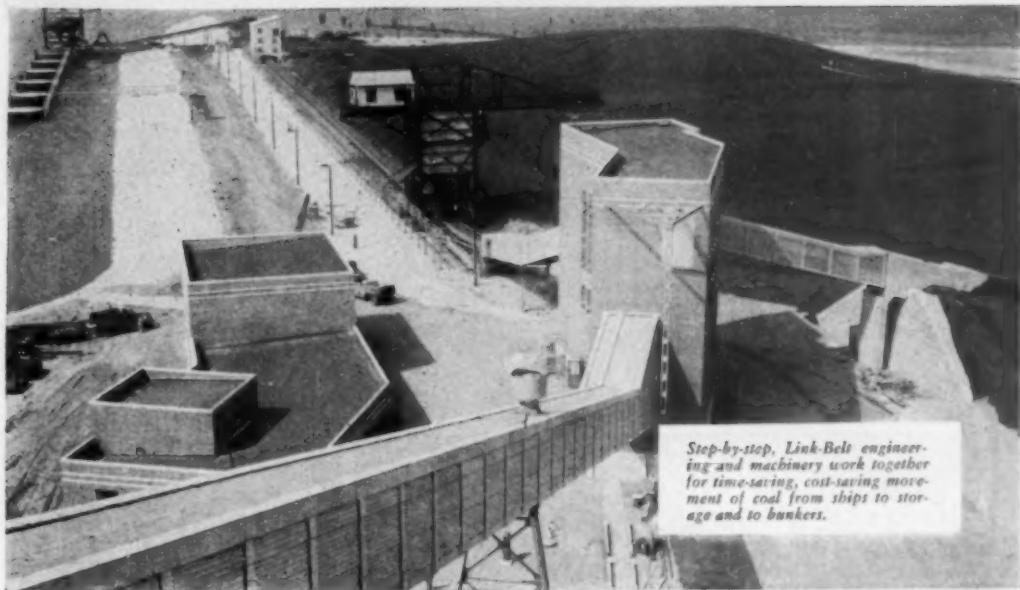
IN CANADA

BIGELOW-LIPTAK OF CANADA, LTD., TORONTO, ONTARIO

**BIGELOW
LIPTAK**
Corporation

ATLANTA • BOSTON • BUFFALO • CHICAGO • CLEVELAND • DENVER • DETROIT • HOUSTON • KANSAS CITY, MO. • LOS ANGELES • MINNEAPOLIS • NEW YORK
PITTSBURGH • PORTLAND, ORE. • ST. LOUIS • ST. PAUL • SALT LAKE CITY • SAN FRANCISCO • SAULT STE. MARIE, MICH. • SEATTLE • TULSA • VANCOUVER, B.C.

LINK-BELT engineering...



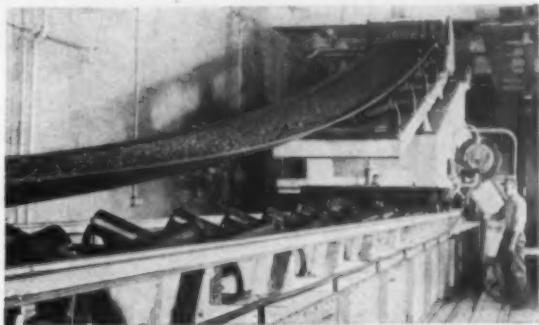
Step-by-step, Link-Belt engineering and machinery work together for time-saving, cost-saving movement of coal from ships to storage and to bunkers.

LINK-BELT equipment...

... combine to cut coal handling costs — from unloading to delivery to power plant bunkers

You name your coal handling problem—look to Link-Belt for the answer! Based on experience gained in hundreds of installations in power plants everywhere—Link-Belt has the facilities, the proven equipment, the engineering know-how to carry the ball from start of operations planning to delivery of coal. Regardless of the size of your plant—Link-Belt engineers can recommend exactly what you need for more efficient coal handling.

Conveyors, elevators, feeders, car dumpers and shakers, screens, hoists, hoppers, chutes, gates, stackers, unloading towers, weigh laries and related power plant equipment



Link-Belt answers a vital need for the more efficient handling of coal in power plants—large and small. Here a Link-Belt Belt Conveyor and motor-operated traveling tripper distribute coal to bunkers through a dust-tight bin seal.

and accessories—all can be supplied by Link-Belt—the most complete line in the field.

So for simpler, more efficient, increased capacity coal handling methods—lower operating and maintenance costs—call on Link-Belt.

Our engineers will cooperate with you or your consultants to find the most economical solution for your problems. Write for details.

LINK-BELT COMPANY: Atlanta, Dallas 1, New Orleans 12, St. Louis 1, Charlotte 2, N. C., Baltimore 18, Birmingham 3, Houston 1, Jacksonville 2. Offices in principal cities.

12,104-C

LINK-BELT
COAL HANDLING EQUIPMENT

More CHEAP ELECTRICITY In The Making!



More "Buffalo" DRAFT FANS In More Power Plants!



Three "Buffalo" Forced Draft Fans being installed in a large power station. Note handy inspection and servicing door in housing.



WRITE for YOUR COPY
of BULLETIN 3750 for
helpful facts on . . .
POWER DRAFT.

Back of cheap power is efficient, dependable draft. The less time out for repairs and the more efficient the fans, the cheaper the final cost of power production. "Buffalo", pioneer manufacturer of mechanical draft fans, has always built them with these ends in view. The 3 Induced Draft Fans above, being installed in a large power station, illustrate the point. Housings are heavy plate with removable scroll liners to withstand fly-ash erosion for maximum time . . . yet their sectional bolted construction facilitates ultimate repairs. Note the large water-cooled bearings. Para-flow dampers on 45-degree inlets and up-blast outlets are a recent "Buffalo" development for accurate draft control. For best results, be sure "Buffalo" Draft Fans are in your plans for cheaper power . . . power you can depend on.

"Buffalo" FIRST FOR FANS
BUFFALO FORGE COMPANY
530 BROADWAY
BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Branch offices in all Principal Cities

VENTILATING
FORCED DRAFT

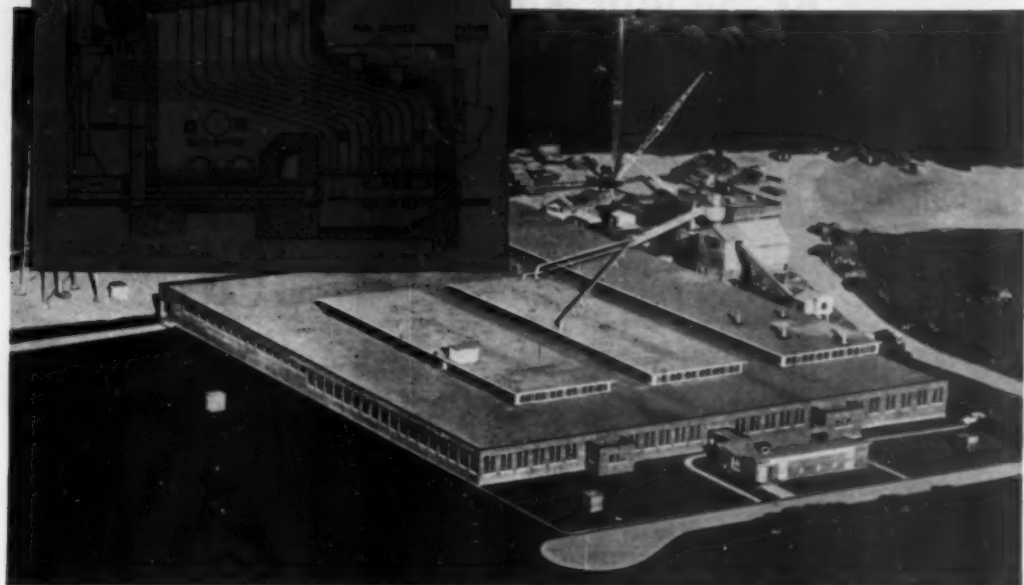
AIR WASHING
COOLING

AIR TEMPERING
HEATING

INDUCED DRAFT
PRESSURE BLOWING

EXHAUSTING

FIRST OF ITS KIND



...United States Plywood gets **4-fuel Economy** with new B&W Boiler

*Another Product
of B&W Engineering
for Economy*

Believed to be the first 4-fuel boiler ever built with a fully water-cooled dutch-oven, United States Plywood's new Type H Stirling unit at Orangeburg, S. C. is designed to burn wet wood . . . and coal, oil, and gas.

Efficient firing of both low- and high-Btu fuels, with minimum maintenance to the dutch-oven walls and arch, enables this unit to do the job of two separate boilers . . . and to show an estimated 35% investment saving over an alternative two-boiler layout. Further, it occupies 30% less space than would ordinarily have been required.

Wood refuse is utilized in the form of sawdust, sanderdust, and chips. Slabs, log cores, or coal can be handfired on grates in an emergency. Provision is also made for firing coal directly into the dutch-oven by spreader stoker . . . with oil and gas, separately or in combination, through burners located at the rear of the main combustion chamber.

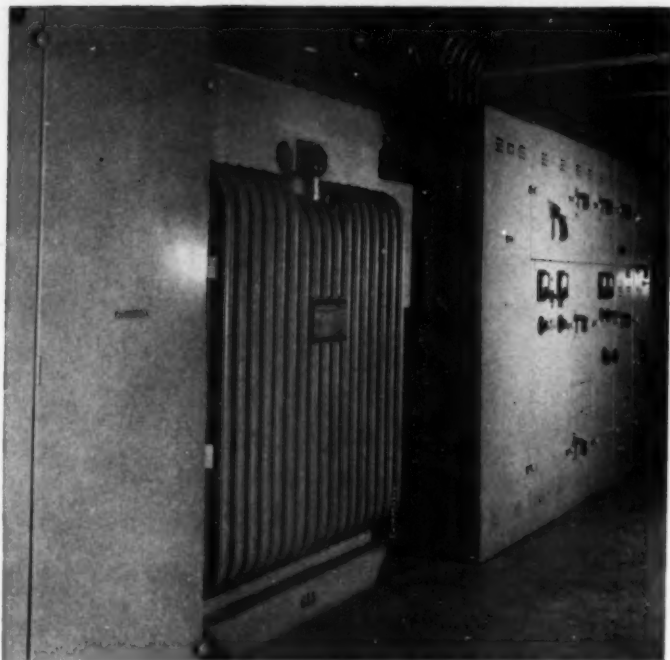
This sort of creative approach to boiler and fuel-burning problems—applied in close cooperation with far-sighted managements and power engineers—has identified B&W with steam-power progress for more than 80 years. It may be just what is needed to effect important economies in working out your steam-generating problems or plans.



Helping Industry cut steam costs since 1867

Milwaukee Plant gets D.C. Power

AT \$5,000 ANNUAL SAVING



IGNITRON RECTIFIER

More than two years of trouble-free 24-hour-a-day operation have proved the advantages of the G-E Ignitron Rectifier installed at the Milwaukee Lace Paper Company.

Compared with the old steam-driven generators previously used, the G-E Ignitron Rectifier shows a saving in operating cost of \$5,000 annually. Stationary engineers are no longer necessary in the company's production of d-c power, can now attend to other plant operations. The G-E Ignitron Rectifier operates 24 hours a day, 7 days a week, with minimum attention. In addition, it gives a steadier, constant voltage over the entire load range, and higher short-time overload capacity.

Supplied as a complete packaged unit with transformer and metal-enclosed switchgear, the installation occupies minimum space.

Call or write your nearest G-E sales office for information on a G-E Ignitron Rectifier to fit your d-c power needs. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

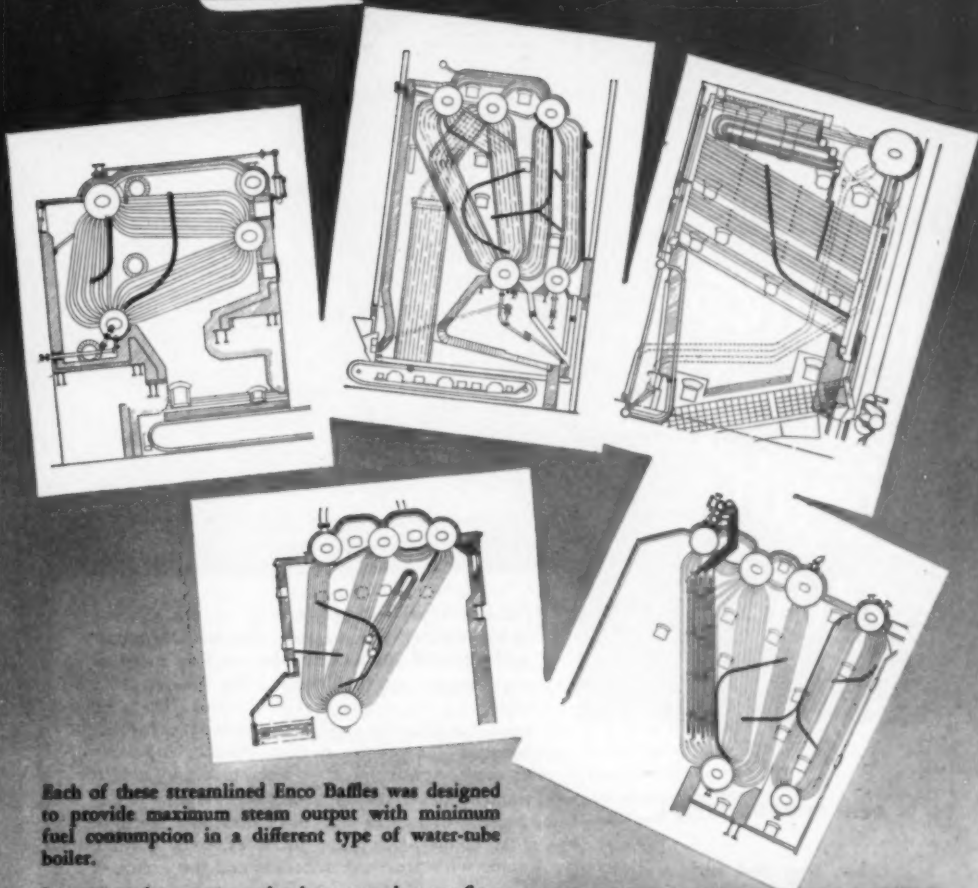


This photograph shows the simple, compact design of the G-E Ignitron Rectifier. No major moving parts to wear out or require attention. No vacuum pump is required. Result is the lowest possible operating cost for producing d-c power.

GENERAL  ELECTRIC

Streamlined for Savings

IN EVERY TYPE OF BOILER



Each of these streamlined Enco Baffles was designed to provide maximum steam output with minimum fuel consumption in a different type of water-tube boiler.

Long sweeping curves maintain a smooth cross flow of gases across every square foot of heating surface. Eddy currents, bottlenecks and dead gas pockets are eliminated—draft losses are cut to a minimum. Soot blowers work more effectively, less steam and less time are needed for cleaning.

Enco Streamline Baffles are individually designed and engineered to the exact requirements of your boiler. Experienced Enco-trained crews take charge of the installation.

The 18-page Enco Bulletin, BW44, shows how engineers throughout industry have gotten higher boiler efficiency and increased steam production through the use of Enco Streamline Baffles. Why not write for your FREE copy today?

The Engineer Company Produces:

ENCO OIL BURNERS
ENCO FUEL OIL PUMPING
AND HEATING UNITS
ENCO AUTOMATIC OIL-ELECTRIC
IGNITION SYSTEM
ENCO AUTOMATIC COMBUSTION
CONTROL

**THE
ENGINEER COMPANY**

75 WEST STREET, NEW YORK 6, N. Y.

Canadian Representative:

F. J. Roskin, Ltd., 370 Rachel E., Montreal, P. Q.

7-219

**THIS
SUPER-VOLTAGE
TESTING OF
OKOLITE-
OKOPRENE**

*assures
lasting
circuit
security*



There is one reason why:

In any cable, tiny and hidden imperfections may not show up at ordinarily-specified test voltages. In actual service, such imperfections can be most treacherous since at normal operating voltage they may not result in dielectric breakdown for several years. Only by the use of super-voltages, both a-c and d-c, are such concealed defects disclosed.

Okonite super-voltage testing is the severest in the industry. For example, Okolite-Okoprene non-shielded 5000-volt cables are first tested at a-c voltages approximately 25% greater than called for by standard specifications. Then, in addition, Okonite applies d-c tests at least three times as high and for periods three times as long as these super-voltage a-c tests. Ordinary cables are not subjected to such tests because they do not possess that extra margin of dielectric strength that Okolite-Okoprene provides. Only a cable made with premium materials and the exclusive Okonite strip process can reliably pass such tests.

Without exception, Okonite applies these self-imposed super-voltage tests to *every foot of all* Okolite-Okoprene cables for *all* voltage ranges—and after 12 hours immersion in water. That's why, when you specify Okolite-Okoprene cables, you can be sure of uninterrupted, trouble-free service—lasting circuit security—year after year after year. The Okonite Company, Passaic, N. J.



OKONITE



insulated wires and cables

THE BEST CABLE IS YOUR BEST POLICY


Sinclair Rubilene Resists Oxidation Gives Long, Low Cost Service

Oxidation attacks oil wherever there is continuous recirculation—in enclosed crankcase systems and, especially, in central circulating systems. It forms damaging acidic compounds, gum, carbon, and sludge. Result: frictional drag is increased, oil lines may become restricted or closed, wear accelerated, efficiency and life lowered.

Many years of experience show Sinclair Rubilene successfully withstands oxidation even under sustained high temperatures. This is due to Rubilene's greater stability and ruggedness. At the same time non-foaming Rubilene assures a solid flow of oil to provide a tough oil cushion between all moving parts. Rubilene thus lessens friction and wear and provides high efficiency and smooth operation.

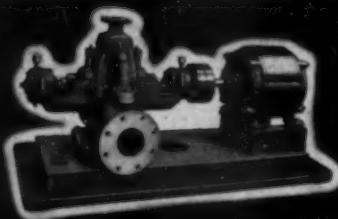
Why not eliminate worry over damaging oxidation and assure reliable lubrication? Use Sinclair Rubilene Oils.

Your nearest Supplier of
Sinclair Products will gladly
arrange for lubrication
counsel, or write to
Sinclair Refining Company,
630 Fifth Avenue,
New York 20, N. Y.



SINCLAIR

Warren-Quimby
Gear-in head Screw Pump



Warren Condensate Pump

Warren Horizontal Duplex
Hydraulic Pump



WARREN PUMPS

Maintain efficiency • Operate at low cost • Are long-lived



Warren Type "L" Single-Stage
Single-Suction Liquor Pump

CENTRIFUGAL

Single and Multi-stage
Pressure range: Up to 1200 P. S. I.
Capacities: Up to 50,000 G. P. M.
Types: Horizontal and Vertical
Impellers: Open or Enclosed

RECIPROCATING

Horizontal and Vertical Single Piston
Horizontal and Vertical Duplex Piston
Single and Duplex Outside Packed Plunger
Single, Duplex and Compound Hydraulic
Steam Heat Vacuum
Automatic Pump and Receiver, etc., etc.,

WARREN-QUIMBY SCREW PUMPS

Gear-in-head and External Gear and Bearing
Capacities: Up to 3000 G. P. M.
Pressures: Up to 200 P. S. I. on low viscosity
liquids; practically unlimited on
high viscosity liquids
Horizontal or Vertical Mounting

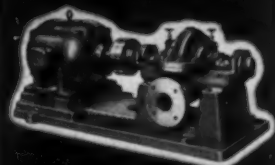
WARREN-QUIMBY ROTARY PUMPS

Gear-in-head and External Gear and Bearing
Capacities: Up to 1000 G. P. M.
Pressures: Up to 250 P. S. I.
Horizontal or Vertical Mounted

Send your pumping problem to us; Warren Engineers will recommend the right pump for the job.



Warren-Quimby External Gear
and Bearing Rotex Pump



Warren Type DBL, Single-Stage
Double Suction, Centrifugal Pump



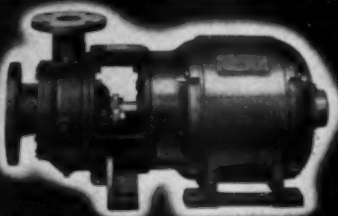
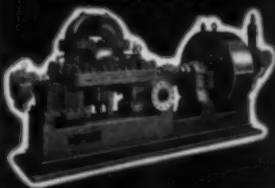
Warren Two-Stage Volute
Centrifugal Pump



WARREN STEAM PUMP COMPANY, INC.

WARREN, MASSACHUSETTS

Warren 4- and 6-Stage
Centrifugal Pumps



Warren "Compacunit"—4 Types—42 Sizes

Warren Horizontal "Realwear"
Duplex Piston Pump





AIR HEATERS

Recommended for Pre-heating, Drying, Dehydrating, Stress Relieving, Controlling Atmospheres and delivering air for Combustion.

The design is radically new and different. It will deliver truly homogeneous heat at the outlet. Any required supply pressure condition can be met with either oil or gas or both as fuels. The unit is compact, light weight, available for vertical or horizontal installation.

The special JZ Air Heater Burner is furnished complete with electric ignition gas pilot and complete safety control equipment as specified. These are available for local installation in air heating units, when desired.

Ask us.



JOHN ZINK COMPANY

4401 So. Peoria

Tulsa, Okla.



**pipng repairs
cost more
now!**

**You make them less often
by using Dependable Quality
CRANE VALVES**

*...That's why
more Crane Valves
are used
than any other make*

easy access prevents trouble with this valve

Remove just two nuts to dismantle this gate valve for inspection, cleaning, or repairs—without taking it from the line. Reassemble just as easily, knowing that Crane clamp design keeps the bonnet joint snug and accurately aligned. Use Crane Clamp Gates on steam, water, and air, but especially in heavy fluid lines needing periodic cleanout. They'll save time, labor, and encourage regular servicing that prevents valve trouble.

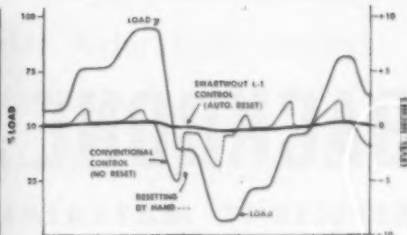
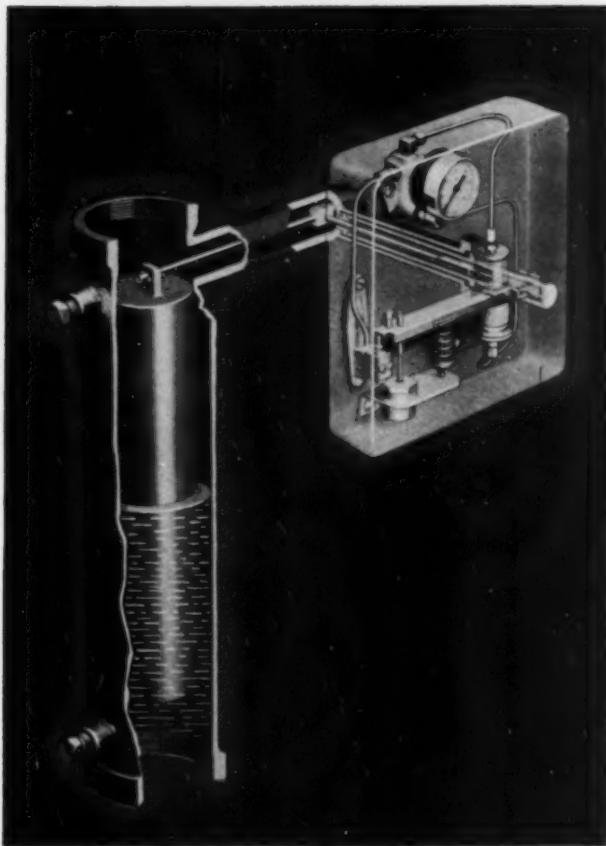
Combining easy access with highly dependable service features, Crane Clamp Gates typify Crane Quality—better valve performance at lowest ultimate cost.

CRANE

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

CRANE CO., General Offices:
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

Hold liquid levels within $\pm 1/2$ inch automatically with Swartwout L1 Displacement Type Controls



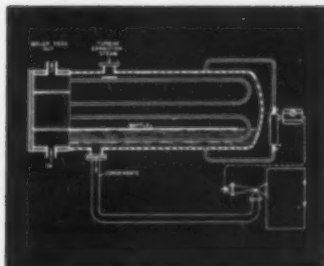
1 Precise control of liquid level from no load to full load without manual readjustment is provided by Swartwout L1 Controls. Setback and reset features compensate for quick-changing loads or long process lags . . . eliminate any tendency to cycle or hunt, yet permit control within narrow range of $\pm 1/2$ inch. Graph (above) shows precision of L1 compared with conventional control on applications where level must be maintained within $\pm 1/2$ inch.

Operating on balance of forces principle, there is little actual movement of parts. Torque tube design eliminates stuffing boxes . . . gives continuous leakproof operation. Since changes in liquid level vary effective weight of displacement type float, L1 Controls can also be used for throttling over full length of float, available in lengths from 15 to 120 inches.

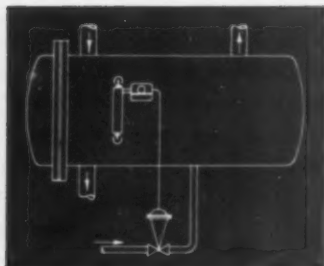
A-3000

Swartwout

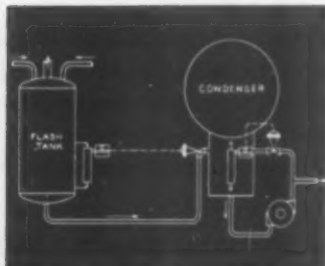
POWER PLANT EQUIPMENT



2 Horizontal Subcooled Heaters—L1 Control holds level to $\pm 1/2$ inch, never lets condensate cover tubes that should be exposed to steam . . . never exposes tubes that should be covered with condensate.



3 Evaporators—Swartwout L1 Displacement Type Control holds level within $\pm 1/2$ inch . . . prevents carryover of solids and contamination of boiler feed water. Increased plant efficiency results.



4 Flash Tanks—Level maintained, in some installations, by L1 Control draining to condenser. Hot well level precisely maintained by controlling condensate recirculation from pump discharge.

SEND FOR BULLETINS S-15-A, S-208-A • THE SWARTWOUT COMPANY, 10511 EUCLID AVENUE, CLEVELAND 12, OHIO

SOUTHERN POWER & INDUSTRY for MAY, 1951

BACKBONE FOR AN EFFICIENT MATERIALS HANDLING SYSTEM...

Westinghouse FREIGHT ELEVATORS

One of industry's biggest headaches today is keeping production costs within profitable limits. And materials handling is a decisive factor in narrowing or expanding those limits.

If your business is a multiple-floor operation that requires an unobstructed flow of parts and supplies from floor to floor, elevators form the backbone of your entire handling system.

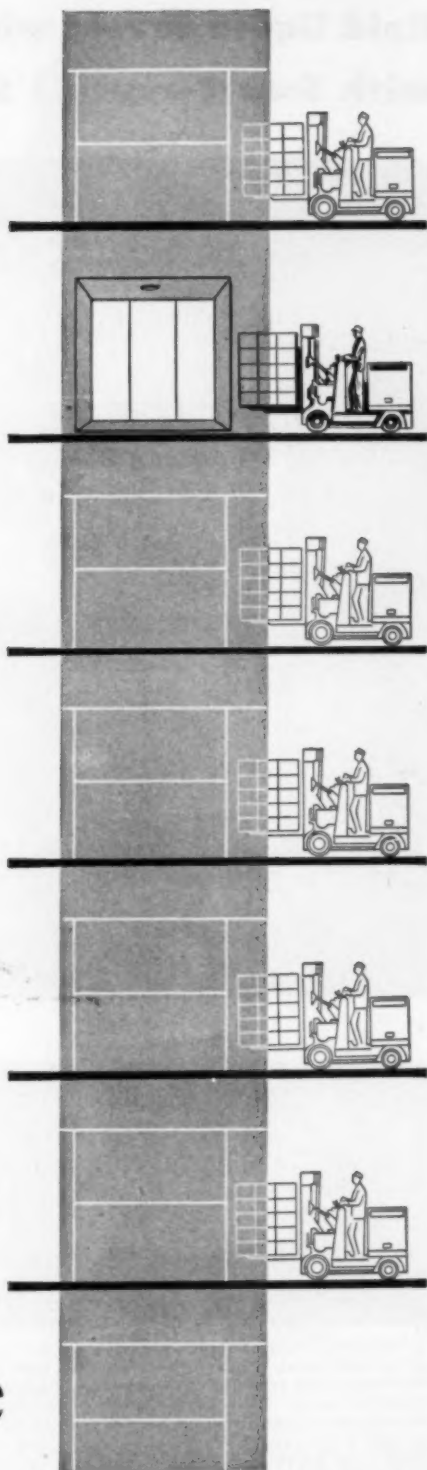
Elevators integrate the facilities of all your floors . . . make sure that time (and money) saved in the efficient flow of materials on one floor is not lost between floors. But, unless you make your freight elevators a planned part of your overall handling system, efficiency drops and costs get out of hand.

To help you plan cost-cutting vertical transportation, Westinghouse offers "The Buyer's Guide for Freight Elevators," (B-4402)—most complete source available on the proper selection and application of freight elevators. For your free copy, write today to the Elevator Division, Westinghouse Electric Corporation, Dept. U, Jersey City, N. J.

YOU CAN BE SURE...IF IT'S

Westinghouse

J-9860P



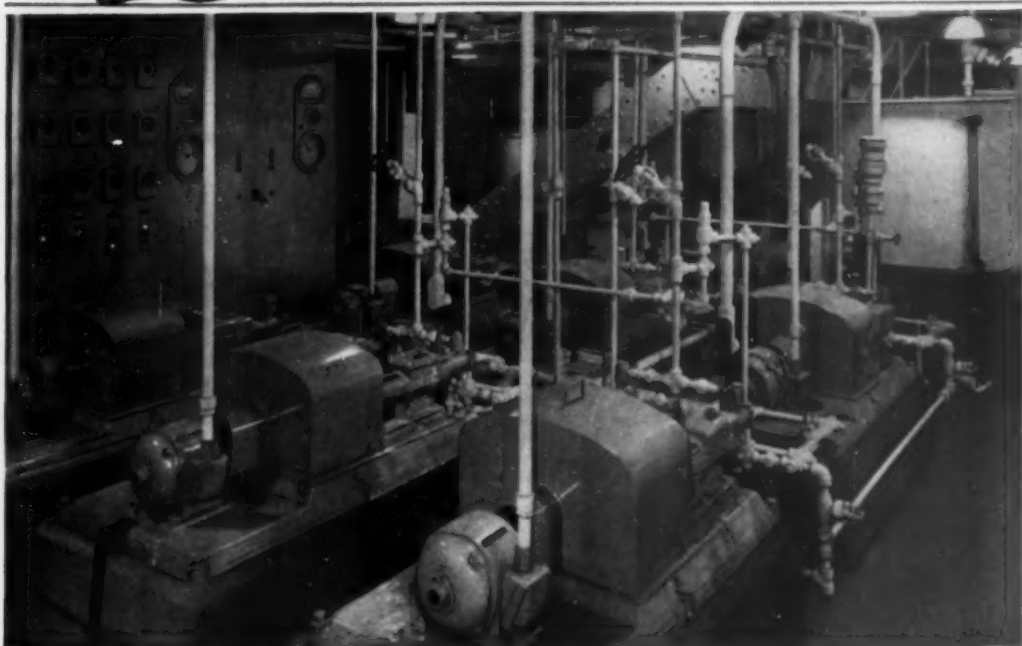
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FOR DEFENSE



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- SAVE FUEL
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% PROPORTIONEERS, INC. %

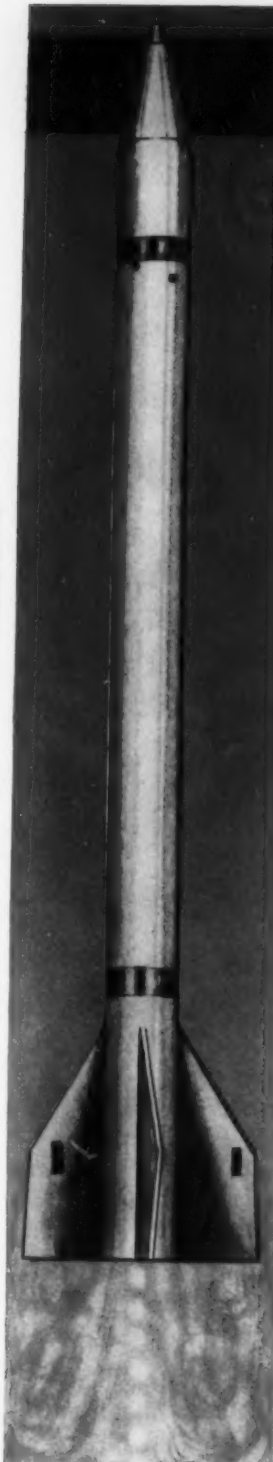
Write to %PROPORTIONEERS, INC., 393 Harris Ave., Providence 1, R. I.

Technical service representatives in principal cities of the United States, Canada, Mexico and other foreign countries.

M O D E R N

Improved LEVEL-TROL®

FOR LIQUID LEVEL CONTROL TRANSMISSION and INDICATION

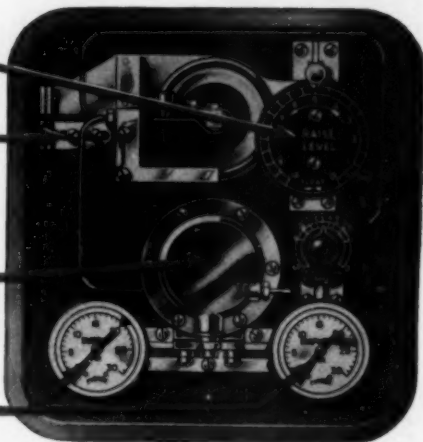


Improved Feature
New level set adjustment.
More highly visible.

Improved Feature
New factory calibrating adjustment makes possible accurate setting of proportional range over full float length.

Improved Feature
New relay—more compact—easily removed—easily assembled.

Improved Feature
Operating medium and diaphragm pressure gauges are glass-enclosed.



Type 2500-249
Level-Trol

• This improved Fisher Series 2500 Level-Trol is designed to better meet the requirements of field service—to give longer life—ease of maintenance. It still combines proportional range and specific gravity setting in one simple adjustment. Die cast weather—proof pilot case with black enamel finish, and improved lock hasp. Series 2500 Pilot Assembly is interchangeable with Fisher Series 2405 Pilot Assemblies now in service.

FISHER GOVERNOR CO.

MARSHALLTOWN, IOWA

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ready to go on your Jobs!

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Nation-wide engineering service for on-the-job assistance and recommendations. Write, wire or phone for the name of the Chromalox Engineering Representative serving you.

CHROMALOX

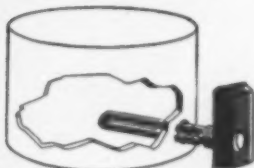
Electric Heat for Modern Industry



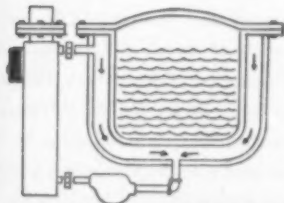
**Variety and
Versatility**
to fit your
Needs Exactly



Chromalox Immersion Heaters with built-in thermostats for portable or permanent use. Drawing illustrates Immersion Units, equipped with sludge-legs, installed over the side of the tank for direct heating. Available in various metal sheaths to resist the corrosive action of the liquid compounds.



Compact, thermostatically controlled, screw-in type Chromalox Immersion Unit is easily installed in smaller tanks and other containers. Thermostat range is 100° to 180° F.



Chromalox Circulation Heaters give accurate, controlled heat up to 750° F. for heating Dowtherm, Aroclor or heat transfer oils. Other uses include water heating applications such as steam boilers and accumulators, kettles, tanks and processing equipment, preheating fuel oils, heating air, nitrogen and other gases, drying steam, plastic powders, etc.

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SOUTHERN POWER & INDUSTRY for MAY, 1951

DETROIT ROTOGRADE

REDUCES COAL COST

12.6 CENTS PER 1000 POUNDS OF STEAM

AT

Certain-teed Products Corporation

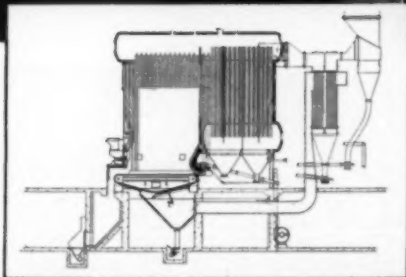
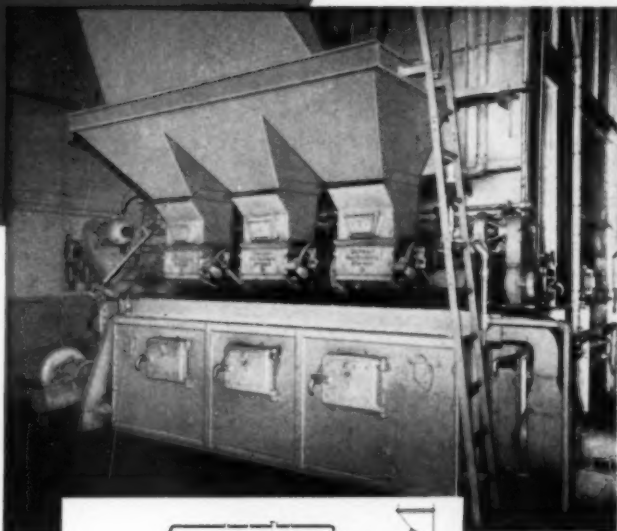
York Pennsylvania Plant

Detroit RotoGrade Stoker with Erie City Type VL Boiler at Certain-teed Products Corporation, York, Pa. Capacity 45,000 pounds steam per hour. Operates with pre-heated air.

Also Capacity
Increased
By 479 Tons
of Product

THIS Detroit RotoGrade Stoker fired unit has reduced fuel cost 12.6c per thousand pounds of steam at Certain-teed Products Corporation plant at York, Penna., according to report by Mr. W. M. Noon, Combustion Engineer. The reduction in steam cost was made at the same time plant capacity was increased.

The Detroit RotoGrade will save you money and improve your operation. It is the original spreader stoker with forward moving grates that discharge the ash at the front. It handles fluctuating as well as steady loads with high thermal efficiency. • You too can save money with Detroit Stokers. Write for Bulletin.



DETROIT STOKER COMPANY

General Motors Building — Detroit 2, Michigan
District Offices in Principal Cities • Works at Monroe, Michigan



[illegible][illegible]

... covering welding fittings and forged steel flanges ...

Here is just about the handiest tool ever devised for the pipe designer. Data on welding fittings and flanges that otherwise could be found only by plowing through many catalog pages and tables have been ingeniously condensed on the two sides of the durable letter-size card illustrated above.

One side covers the broad WeldELL line of Taylor Forge welding fittings. For every nominal pipe size, 1/2" through 30", it shows the wall thickness for every weight of every fitting in every available material. It also shows all required dimensions of all types of fittings.

The other side covers the world's most complete line of forged steel flanges. For every nominal pipe size, 1/2"

through 24", it gives all essential dimensional and bolting data for all types of flanges in all weights. A particularly useful table (see reproduction) is that showing welding neck flange bores which enables you to determine the I.D. of any nominal pipe size without separate calculation. Thus the sheet gives you O.D. and I.D. of any weight of pipe.

The card is varnished to make it stand the steady usage you are certain to give it. To obtain your copy see your Taylor Forge distributor or **MAIL THE COUPON**

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758-0551 Mail to Taylor Forge & Pipe Works, P.O. Box 485, Chicago 90, Ill.

Stop Expensive Slamming With the Cushioned Closing of **CHAPMAN** ^{TILTING DISC} Check Valves

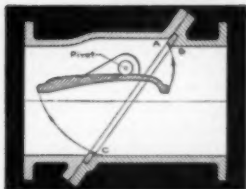


Those words — *cushioned closing* — best describe the action of this unique check valve. The tilting disc works with the stream—opens easily, closes quickly, *yet quietly*. There's no slamming — no resultant destructive stresses on the pipeline.

As a result of this smooth, *cushioned action*, maintenance costs are at a minimum and savings of from 65% to 80% in head losses can be obtained over conventional-type check valves.

Send today for the bulletin describing this unusual valve.

THE CHAPMAN VALVE MFG. CO.
INDIAN ORCHARD, MASSACHUSETTS



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

Timely Comments



Foundation for Maintenance

WHAT MAKES machinery need repairs? Actually a lot of things do, but nearly all fall under one of two heads: (1) chemical action, (2) motion. So the most important tools in the preventive maintenance field are protective coatings to limit atmospheric and chemical damage, and lubricants to smooth the path of motion and limit wear.

Add only a few elements to lubricants and coatings, and the preventive maintenance program starts taking shape. First comes design that keeps damaging chemicals in their place and defeats wear as nearly as possible by limiting it at its source. Next, we believe the operators are a most important element in the preventive program; their regular care and good sense is essential to the maintenance program's success.

So with good protection from corrosion, good lubrication, good design, and good operators, the Maintenance Supervisor's job is made a lot easier. But he still has a place in the sun; the very maintenance of these ideal conditions is a full size maintenance job in itself.

A fairly good index of how much wear to expect is the power consumption. Most industrial processes consume more power in overcoming friction of moving parts than in productive work. Power hogs are enemies of maintenance: misalignment, poor bearings, faulty belts, wrong lubricants, dust, dirt and abrasives. They all increase the power load, and they all increase the maintenance bill. Watch sudden or gradual increases in power. Such flights of the power meter are more likely to be caused by some objectionable condition than by increased production—unless, of course, definite plant changes have been made.

Vibration is another enemy—and it does not quite fit into the above discussion. But to at least some extent it goes hand in hand with improper power transmission. It takes power—the wrong kind of power—to make things vibrate. And usually it is more desirable to remove the cause than to correct the effect.

We have not said anything yet about the Fix-it Crew, because, important as they are, the repairmen serve as a last resort. They come in only after something has gone wrong—and the purpose of preventive maintenance is to keep things from going wrong. The man with the wrench, however, is the operator's friend—and neither one should forget it. They can team up on the ever present destructive forces and keep them within limits.

Now we come to balance: prevention versus cure; cost of design as compared with cost of repairs. The

preventive maintenance program broadens into a complete maintenance program. And success in saving dollars depends on (1) Planning, (2) Records, and (3) Procedure.

Theoretically, plants might be designed and operated in such manner that maintenance would be almost eliminated. But to do so would cost too much. High capital cost, and unreasonable operating care would over balance normal maintenance costs. So balance is very important. The job is to keep the total cost down.

Big plants are not much different from little ones. It takes about as much skill to properly maintain one machine as 100. So planning, records, and procedure are important in any plant. Planning prevents surprises and allows reasonable scheduling of work. Records show what needs to be done. Procedures show how to do it.

Maintenance is subject to exact engineering analysis. It can be reduced to a science, and subjecting it to thorough scientific analysis reduces its cost.

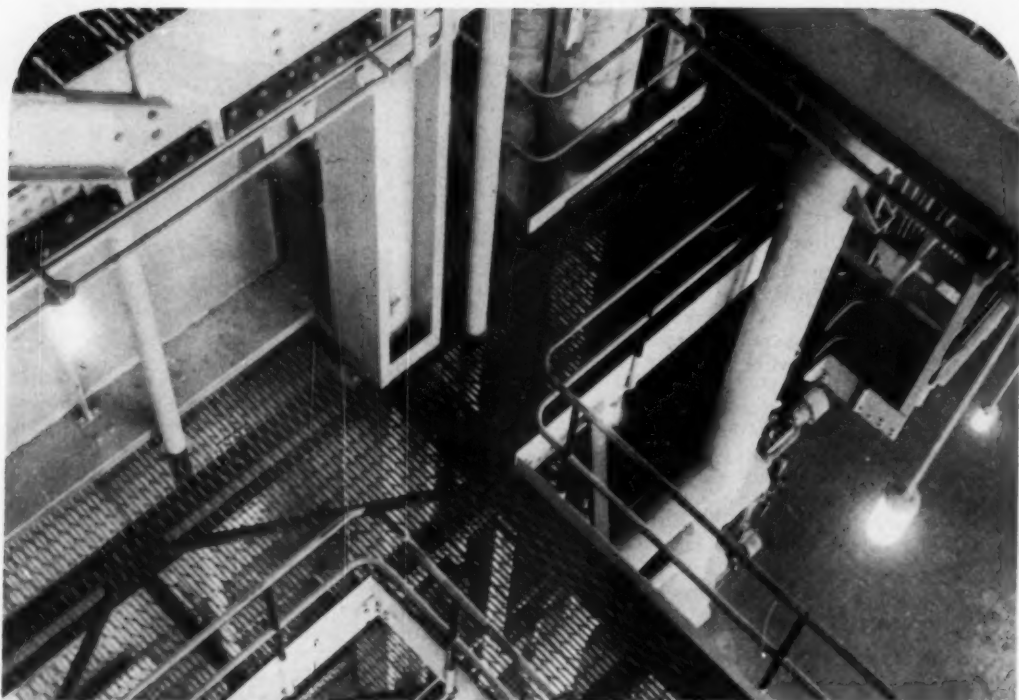
May Maintenance Issue

Both the authors and the editors are forced to more generalization in this MAINTENANCE issue than they would like. Over-

whelming numbers of specific problems and solutions make it impossible to deal adequately with anything other than basic principles and procedures. Each maintenance head must examine the peculiarities of his own equipment and organization and specifically apply this general information to meet his own needs.

Every article in the issue is supplied by an authority in his field. Some of the authors are maintenance men in Southern industrial plants, and others are equipment manufacturers' specialists on certain types of equipment. The plant maintenance men have the widest knowledge, because they handle a wide variety of equipment. On the other hand the factory specialists are best equipped to give exact detail on specific types of equipment. That is the reason your editors have diversified their coverage of the maintenance problem by giving material from both sources.

Finally, the plant man must set his own program and establish his own procedures to meet his own needs. He can secure a vast amount of help from a great many sources, but interpreting and applying that information is his own job.



SAVE ON FLOOR GRATING INSTALLATIONS...

avoid costly field corrections with **BORDEN'S free planning and checking service**

In filling your order, Borden follows these steps to insure correct dimensions, fit and placement.

1. A shop drawing of the job is submitted to the customer for approval, when necessary. This plan shows the size and shape of the grating area—how grating clears all obstructions.

2. Each finished panel is carefully checked for accuracy of dimensions.

3. Each panel is plainly marked with its number to insure quick, easy installation.

4. The entire platform is laid out on our shop floor. Overall dimensions and obstruction openings are checked against shop drawings.

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**Southern Division — Leeds, Ala.
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describing services and features of Borden Floor Gratings.

Borden manufactures all three types of floor grating, servicing from strategically located plants.

Industry Speaks

Engineering Talent Getting Tighter and Tighter

The American Society for Engineering Education's Manpower Committee estimates a cumulative shortage of 40,000 in engineering ranks by 1954. What do we do to make the best of the immediate situation?

The following practical suggestions for interim measures are adapted from a talk presented by H. N. Muller, Jr., Assistant to the Vice President, Westinghouse Electric Corporation at the recent Southeastern Electric Exchange meeting in St. Petersburg, Florida.

It is the duty of the employer to provide a flexible program of orientation and training. Modern technical industry is tremendously complex and the transition from directed-development in college to self-development in industry is no longer an easy one.

While the craftsman of former years grew up with the business, the college graduate of today steps into a strange organization at a relatively high level. He has no opportunity to understand, through long association, the methods and operation of the concern. During his first few years he is finding his place in the organization, attempting to understand himself and shaping his professional goal. He needs assistance in making the transition from directed-development to self-development.

Many industrial employers have recognized this need and currently do a good job in orientation and training. A good training program instills healthy attitudes. The young graduate has been carefully selected as a potential key man. He reports to work with high hopes, ready to really wade in and build a reputation. These hopes are further elevated when he finds that his company is devoting the time and effort necessary to acquaint him with its policies, objectives, and operating procedures. He knows that he is, at best, only semi-productive and yet the company sees fit to pay him a salary while training him. Certainly this company must have plans for him.

Contrast this with the direct employment case; that is, hiring an engineering graduate for a specific job and plopping him into it with no training. He starts becoming a productive employee the first day, and many years may pass before he learns, piece by piece, what the overall company operation is and how it is organized. He learns the hard way what facilities and services are available to him, and he may make many embarrassing mistakes.

Smaller companies, taking only two or three graduate engineers per year, have the greatest opportunity possible to personalize their orientation and training period. Because the organization is small, closer contact with the men of experience and leadership in the organization is possible. Elaborate class room set-ups, essential in the big company, are not necessary in the small one.

Urge younger men to continue their education. Education is a journey; not a destination. Nothing enables a man to accomplish the maximum amount in his job better than good learning habits. His morale as a budding professional man is kept high if the employer encourages and assists him to supplement his college training by evening classes or guided self-study.

Make sure your engineers are doing engineering. Are your trained engineers doing work that can be assigned to supporting personnel? This practice uses up technical manpower that takes a very minimum of four years to train, in jobs that can be filled by technicians with rather little specialized training.

It is also an economic waste to your company. Using engineers to accomplish testing, drafting, etc., is an expensive way to get the job done. These work assignments are effective training for many engineering jobs but unless the engineer is for some clear reason of severely limited potential, these jobs can be done cheaper and with more honest satisfaction by supporting level personnel.

The young man of high potential will only develop at a maximum rate if he is kept in work that is a challenge to his ability and experience, so that while he can keep his head above water, it is not without some struggle. If you are careful to place young engineers in jobs where continued challenge exists, you may be amazed to see how rapidly they grow to meet the opportunity that they, then, are able to see.

Maintenance is Big Business at

\$2,500,000 central mechanical maintenance building plus \$750,000 in machine tools and equipment

Controlled conditions, including air conditioning, humidity control and acoustical treatment

Top notch utilization of materials handling equipment for maintenance work

Marked improvement in efficiency of mechanical maintenance operation

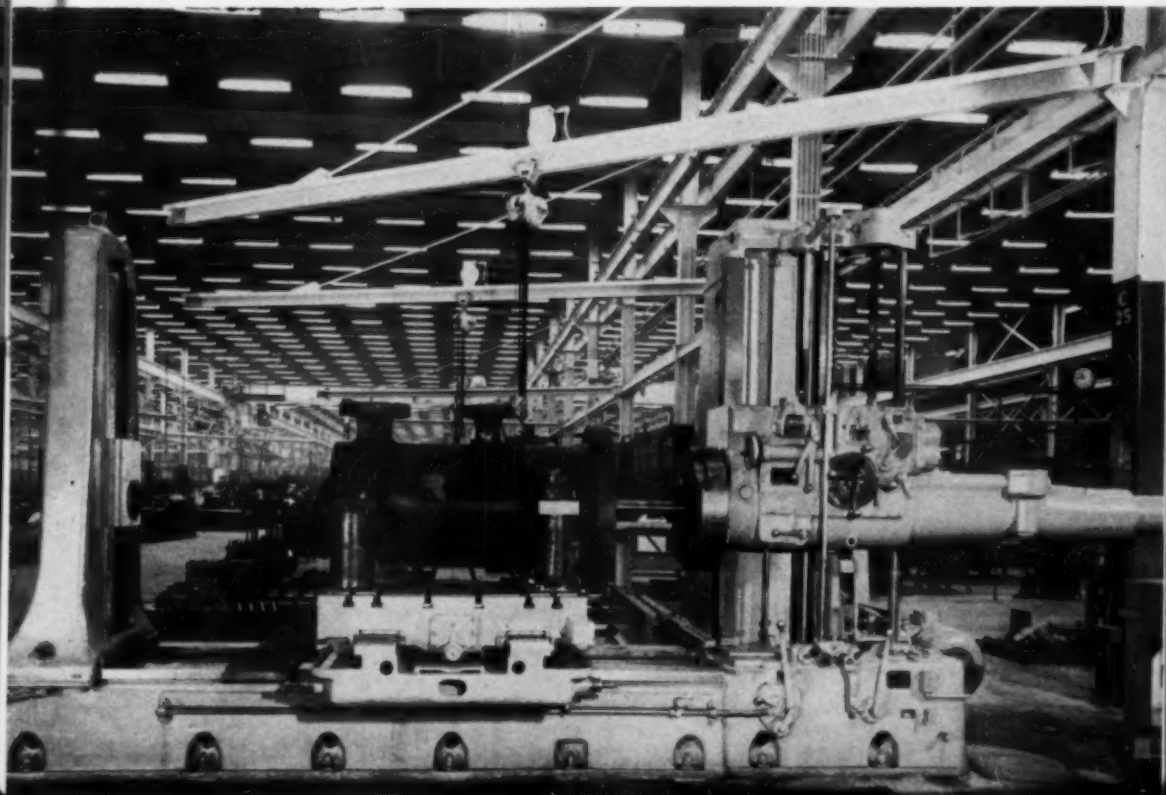
**More output per man
through modern equipment
centralized shop and
controlled conditions**

By E. C. MAGEE

Division Engineer
Baton Rouge Refinery
Esso Standard Oil Co.

ONE phase of the mechanical modernization program at Esso Standard Oil Company's 245,000 B/D Baton Rouge Refinery is

Building is equipped with the most modern machines and tools available for diversified refinery maintenance work. This 96-in. horizontal mill is in the machine section of the shop. Note the application of the most efficient material handling devices. Built-in facilities, such as, three 15 ton bridge cranes and forty-eight 1 ton jib cranes, are supplemented with gasoline powered 4000 lb capacity fork-lift trucks and a traveloader.



Esso's Baton Rouge Refinery

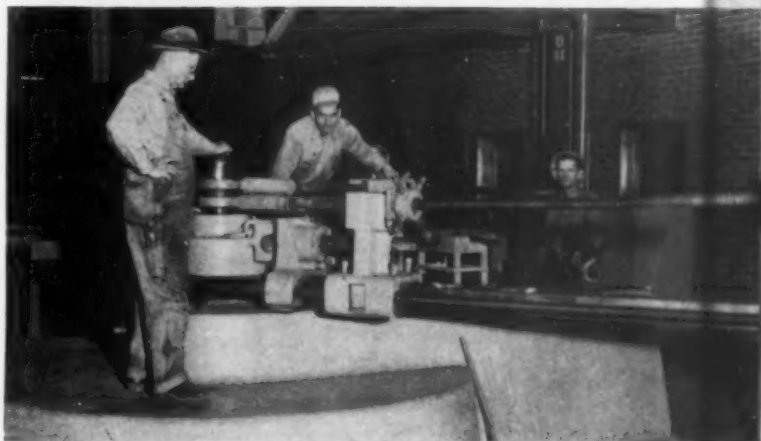
the 236 by 600 ft central mechanical building providing 141,000 sq ft of floor area. It is designed for stepwise expansion to include all shop maintenance and storehouse facilities under one roof.

Corrugated transit siding above brick wainscot is used for three walls while the south wall is of transite only to allow for future expansion in that direction. The inside walls are Celotex-acoustical board above the brick wainscoting. The roof is a flat built-up composition type over metal decking. The building is completely air conditioned and artificially lighted. Acoustical treatment of the walls and ceiling was included to reduce noise below a disturbing level.

Designed as a rigid frame structure, the building consists of three 72 ft wide bays with uniform bent spacing of 24 ft. The height to the roof is 37 ft and to the bridge crane rail 27 ft. A 20 ft wide three-story utility bay is located at the south side of the building and houses all fixed facilities such as offices,

washrooms, cafeteria, utility piping, and air conditioning equip-

ment. Each 72 ft bay is serviced by a 15 ton bridge crane. This design

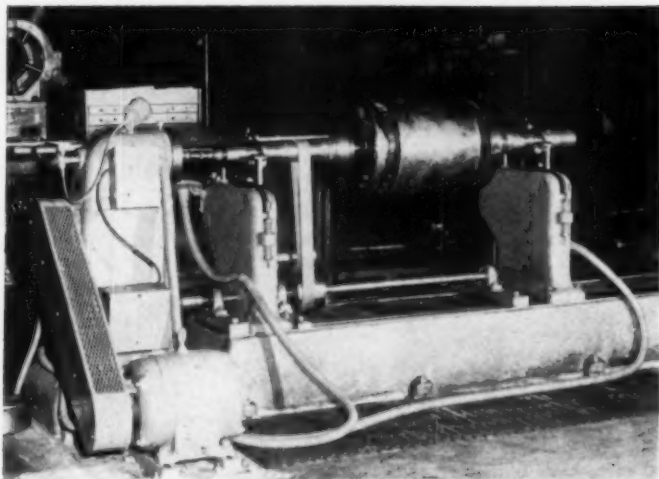


Lighting is supplied by 2352 — 100 watt, 3500 degree K-white fluorescent lamps with a rated life of 6500 hours. Lamp replacements are made from the bridge cranes on a predetermined schedule. This replacement program assures maximum light intensities at all times. Floor is a 6-in. thick reinforced concrete slab with a smooth troweled finish. The normal 2500 lb concrete was vacuum treated to obtain 4000 lb strength in 7 days and to provide a more homogeneous mass for easier maintenance.

Pipe bending machine handling 3-in. tubing. All machines have been given a modified color conditioning of buff work areas against a base machine gray. Utility outlets are color coded and stencilled to indicate the flow medium.

In addition to the usual machine tools, a number of special, semi-production or large capacity tools are provided. This electronically controlled multiple flame cutter is used for most shape cutting while two semi-portable flame cutters serve to handle the overflow from the multiple unit.





Dynamic balancing machine balancing electric motor rotor. Electrical section of Esso's modern maintenance shop also has two drying ovens, spray booth and motor rewinding equipment.

provides efficient overhead handling facilities and eliminates the need for any multistage structures in the 72 ft wide bay. Partition walls between craft work areas were purposely omitted to expedite material handling and to permit flexibility of craft areas as needed.

Construction Features

One of the outstanding features of the building is its simple structural and roof design affording maximum column spacing and a practical low maintenance roof. The ceiling construction from the inside out, is $\frac{3}{4}$ -in. rib lath with ribs inverted, 15 mil Fiberglas mat covered with a full thickness of rockwool insulation. Above the ceiling and insulation is an air space. The pitch topped, 4 ply membrane, gravel topped roof is built up on a 1-in. thick layer of rigid insulation and is supported by $1\frac{1}{2}$ -in. galvanized metal decking.

Air Conditioning

Year-round air conditioning and humidity control was considered a necessary part of this project and was justified on the basis of employee comfort and as a means for protecting the precision equipment and stored materials. The twelve air handling units for the work area and offices circulate 307,200 cfm. The system is designed for an inside temperature of 78 F

when the outside dry bulb temperature is 92 F and the outside wet bulb temperature is 80 F. Relative humidity is not to exceed 50 per cent. In the winter a temperature of 65 F is maintained when the outside dry bulb temperature is 20 F.

One air conditioning system, consisting of a refrigeration unit of 1100 ton capacity made up of a cooler, condenser, and centrifugal compressor, utilizing freon as a

refrigerant, and driven by a 1200 hp synchronous motor, is used for the entire building. The refrigerant is cooled by an induced draft counterflow cooling tower supplying water to the refrigeration condenser at 87 F. The refrigeration unit delivers chilled water to the twelve blower systems at an inlet temperature of 45 F. The control system is completely automatic and operates from ten zone control stations in the work area and from two control stations for the offices and washrooms. The system was designed for a normal operation of 75 per cent recirculated air and 25 per cent fresh air makeup. Exhaust fans are used at critical points to exhaust heated air through the roof.

Tools

The building has been equipped with the most modern machines and tools available for diversified refinery maintenance work.

In addition to the usual machine tools found in a shop of this type, a number of special, semi-production or large capacity tools are provided to more efficiently handle jobs peculiar to this refinery. Some of the tools in this category are:

Machine section—a 48-in. swing by 21 ft bed lathe with power traverse, a 96-in. horizontal mill, a 42-in. vertical turret lathe, a number 5 ram type turret lathe, a 24-in.

Traveloader moving structural steel into the shop. All heavy materials are palletized with the exception of structural shapes, plate and large piping. These are stored in the shop on racks of special design to permit handling by bridge or jib cranes.



x 96-in. cylindrical grinder, a precision lapping machine for mechanical pump seal maintenance, a multiple plug valve lapping machine capable of refinishing up to ten valves at a time, a dynamic balancer with a capacity of from 20 to 3000 lb, adjustable angle abrasive saw and a contour saw.

The boiler section has roll capacity through $\frac{7}{8}$ -in. x 10 ft plate and 4 x 4 x $\frac{3}{8}$ -in. angle. A $\frac{1}{2}$ -in. x 10 ft capacity press brake is used for forming special shapes. The usual punches and shears are used on smaller shapes. An electronically controlled multiple flame cutter is used for most shape cutting while two semi-portable flame cutters serve to handle the overflow from the multiple unit. Heat treating furnaces, forges, and a steam forge hammer furnish complete blacksmith coverage. The pipe section has pipe threading machines ranging in capacity from $\frac{1}{4}$ -in. through 16-in. pipe and power bending facilities for up to 10-in. extra heavy pipe.

Housekeeping

An item of major importance, from the standpoint of efficient job performance and safety, is good housekeeping. This is stressed continuously and every aid to good housekeeping is provided to accomplish this aim. Gasoline powered sweepers, vacuum cleaners, and scrubbing machines are used by the cleaning crews to maintain the $3\frac{1}{4}$ acre floor area. Scrap bins, trash cans, and other waste receptacles are permanently located by floor markings to keep the areas clean and the floor unobstructed.

Utility Bay

The twenty foot utility bay along the south side of the structure is utilized to the fullest extent. Offices for engineers, inspectors, and the clerical staff, along with the washrooms and air conditioning compressor, occupy the ground floor.

A small cafeteria line plus tables enough to accommodate the entire building personnel is located at mezzanine level above the offices of the western half of the building.

Coordination

This building, which houses over 200 workmen and 17 supervisors

in 7 major craft divisions, along with the necessary machines, tools, and stores, under its $3\frac{1}{4}$ acre roof, is actually operated as a single unit. It was realized early in the planning stage that a highly effective central coordination system was as necessary to the operation of the building as modern tools and material handling equipment. This system was developed and piloted in the Machinist Division, then expanded to its present full scale status in moving to the new building.

The Operational Control System coordinates each phase of the operation of the building and provides a mechanism for the control of work planning and scheduling, coordination of manpower, maximum utilization of machines, material procurement and handling, timekeeping, job standards, and the maintenance of permanent records on the many pumps, turbines, motors, and heat exchangers in the refinery.

All incoming and outgoing jobs are handled through a central dispatch point. The dispatcher works closely with the foremen and clerks in four other control points located at strategic points within the building.

All jobs reaching the building

are accompanied by written work requests. The information appearing on the request is entered on a job card at the dispatch point, and, since the card follows the job throughout its stay in the building, a complete record of the job is obtained. A completion date entered on the card sets the priority and paces the work tempo on that particular job.

Top Efficiency

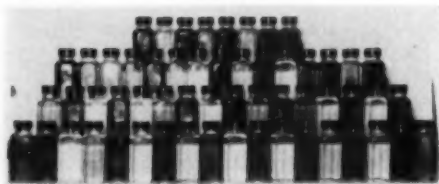
It has been demonstrated that by housing most of a refinery's shop operations under one roof a marked improvement in efficiency is obtained. The new machine tools and material handling equipment turn out more work per man. Joint use of common facilities by the crafts reduces the original investment and subsequent maintenance. Time lost in transporting jobs and material between shops is eliminated. Optimum working conditions provide for more output per man. By including within the building those stores materials normally used by the craftsmen, the time required to complete most jobs is reduced appreciably. Finally, closer cooperation between crafts promotes a spirit of teamwork that results in better planning and coordination of all craft activities.

Small cafeteria is located at mezzanine level. A third floor serves the ventilating and air conditioning equipment. Locker facilities are available in a large central change house near plant entrance.



Lubricating Practices

Simplified Through Standardization



STANDARDIZATION reduced
number of lubricants stocked
FROM 57 to 11



By **B. H. JORGENSEN**

Material Standards Department
Tennessee Eastman Company
Kingsport, Tennessee

The fact that the wheels are humming does not necessarily mean that down time caused by faulty lubrication is being held to a minimum. Nor does it mean that the lubrication methods are in conformance with best practice and fit into a controlled preventive maintenance program.

THE problem of lubrication becomes more important and more difficult with the ever increasing complexity of modern industrial equipment operating at higher and higher speeds, with closer and closer tolerances, higher loads, and under varying operating conditions. However, in many industries, interest in this vital subject has been lagging and as a result, the science of properly lubricating equipment and machinery has not advanced or kept pace with engineering and design of equipment.

This is not the fault of the producers of lubricants who have,

through many years of research, developed lubricants with qualities totally unknown a few years ago. Rather, it has been caused by the failure of people responsible for the lubrication of industrial equipment to take advantage of the research and development which have been put into the lubricants by the manufacturers.

MULTIPLICITY OF LUBRICANTS

New Equipment

Manufacturer's warranties and guarantees are sometimes contingent upon the use of a lubricant designated only by one specific brand

name. No quarrel is found with this practice, although it contributes nothing toward reducing the number of lubricants a manufacturer must keep on hand in Stores. Small companies are frequently not prepared to develop specifications or to test oils to determine their adequacy with respect to requirements of purchasing specifications.

In a larger company a Lubrication Practice Manual, which will be discussed more fully, might have this to say, "Quite often machines purchased for a particular service come with the manufacturer's recommendation as to what grade and brand of oil should be used. Such information should serve only as a guide as to the type of lubricant to be used and should not necessarily be regarded as a positive specification. An equipment manufacturer's statement that only one brand of oil will work in any piece of equipment indicates that either he has not analyzed the problem thoroughly or he has not had the necessary experience in judging performance of oils."

Obsolete Equipment

It has been found that lubricants are stocked in Stores, although the equipment for which they were originally purchased is obsolete or,

as sometimes happens, is even dismantled.

To overcome situations of this kind, the usage records of all lubricants stocked in Stores should be examined at periodic intervals. Facts concerning slow moving, or non-moving oils should be examined and suitable action taken toward the disposal of all lubricants for which no further specific use is found.

Surprising situations are often encountered in such surveys. It must be recognized, however, that continued checking of usage records is essential to obtain expected results. Sporadic or irregular attention to this detail in the simplification of lubrication practices will leave much undone, and allow the same situation to recur sooner or later.

Brand Names

Reduction in the number of lubricants stocked in Stores when they are identified by brand names is a difficult problem for companies operating without testing laboratories or specifications. Apparently the only solution to this problem is rigid control over the introduction of new brand names on the stock list. Necessary experience in this regard is generally gained only through time, trial, and error.

APPROACH TO SIMPLIFICATION

Several years ago, the management at Tennessee Eastman became concerned with what appeared to be an excessive number of lubricants specified, purchased, stocked and used. A committee of maintenance engineers of various divisions and departments of the plant was appointed by top management to study this problem. The committee functions in accord with a definite Organization Chart and is advised and assisted in its work by staff organization of Purchasing, Stores, Testing Laboratory, and the Material Standards Department.

Each committee member was assigned a specific aspect of lubrication on which he was expected to become a specialist . . . develop information, accumulate reference material, and in general, become as familiar with that particular phase of lubrication as possible.

Functions of the Company Lubrication Committee

1. Simplification of lubrication practices and standardization of lubricants.
2. Development of lubricant specifications.
3. Concerted action on lubrication problems with a continuity of effort toward their solution.
4. Testing new lubricants in one or more applications prior to approval for plant wide use.
5. Dissemination of information throughout plant by distribution of practice manuals, meetings, and conferences.
6. Provision of specialists for solution of particular and specific plant lubrication problems.
7. Laboratory analysis to determine that all lubricants received meet the requirements of the specification under which purchased.
8. Establishment of standard methods in the storage and handling of lubricants.
9. Approval of equipment design to provide for effective lubrication.

Under this plan, the member most familiar with the economic aspects of centralized lubrication vs. manually lubricated equipment would refer questions concerning an oil reclamation problem to the committee specialist in that field. The oil reclamation specialist and all members attend the regular scheduled meetings of the lubrication committee where solutions to the specific problems come up for discussion and decision by the committee.

Additionally, the Engineering Department representative on the committee, has been assigned the responsibility of examining all drawings for new equipment while still in the design stage to assure that adequate lubrication has not

been overlooked; that bearings and housings are designed so equipment can be lubricated efficiently and economically, and that provision for centralized lubrication is provided when desirable. This is what may be termed preventive maintenance placed in effect while a machine is still in a designer's head and while he is probably harried and baffled by a good many problems, only one of which may be effective lubrication for his brain child.

Some of the men appointed to this committee have been asked to speak before national conventions and technical societies on matters of interest in the particular field of lubrication on which they were specializing. Articles on lubrication

The Lubrication Committee considering a problem.





Viscosity of an incoming oil shipment being tested by the Kinematic method in the control laboratory.

tion have also been submitted to this group for critical consideration and comment before publication. In the light of this experience, it is believed that for some companies, at least, the committee system of standardization and simplification of lubricants and lubricating procedures is the most practical and simplest of the various methods for achieving real lubrication.

There is nothing new or revolutionary about the system. General Motors, Detroit Edison, and other industries have been following essentially similar methods for years.

Meetings

During the initial work of the committee, meetings were held once each month. When standards were finally established, the meetings were reduced to a quarterly basis. The minutes of the meetings are written by the Material Standards Department and given necessary distribution to all concerned.

First Step

The records of all lubricants used and consumed in the plant for the previous year were carefully examined. It was found that 57 types of lubricants were considered "necessary" at that time for the adequate lubrication of plant equipment. After a searching investigation concerning the need for each of these types, and following much argument, much discussion and a

great deal of compromise, the committee reduced the number of oils and lubricants from 57 to 11 standard types. As can be understood, this objective was not accomplished overnight. The entire program covered several years and is still continuing.

In addition to eliminating the confusion that always results from the use of a large variety of supplies, actual and continuous experience with the eleven standard lubricants adopted by the committee reflects a much more satisfactory

lubrication performance than was obtained through the use of the 57 types formerly thought necessary. Significant savings have resulted, not only through simplification of work and decreased maintenance costs, but because of purchasing and stocking fewer varieties of oils and greases.

Controls and Specifications

A purchasing specification for each standard lubricant is written by Material Standards for the criticism of the lubrication committee. Upon approval, the specification is submitted for the approval of Management after which it is reproduced and distributed by Material Standards to the vendors and to persons within the plant who are in any way connected with maintenance of equipment. The Purchasing Department does not purchase lubricants for general plant use except on a specification basis and with approval of the lubrication committee.

Vendors are requested to mark drums and containers of lubricants with the purchase specification number, which then becomes the Stores stock number. The oil or grease is then requisitioned and issued under that designation. Laboratory tests are made and also reported by the specification number to control quality of incoming lubricants.

The committee chairman discussing a test being made on cutting oils with one of the men actually making the test.



LUBRICATION MANUAL

Purchasing specifications are generally of a technical nature intended to describe limits in viscosity, flash point, pour point, the rusting, oxidation and other characteristics of lubricants required, as well as detailed laboratory methods used in making such determinations. These specifications are by no means "light reading," and generally are of service only to the Purchasing Department, the Vendors, the Laboratory, and the Lubrication Committee.

To transmit this information in a more practical manner to the lubrication men in the plant, a practice manual of 27 pages was prepared. The objective of the manual was to simply describe the characteristics of the lubricants, and indicate the uses for which they are intended. The manual was written for the men in the plant, and was designed to eliminate as much of the technical material as possible, and yet clearly describe the lubricants and the various methods of application. The manual also describes the fundamentals of lubrication in a practical manner and contains officially approved procedures to be followed in lubrication matters by all concerned throughout the plant.

Lubricant tests which are made in the laboratory are briefly described in order that their significance may be understood by the plant personnel. The importance of regular schedules and frequent inspections, and the damage that can be done to expensive equipment by contamination and careless handling of lubricants are carefully pointed out. Procedures for receiving, storing, and sampling lubricants are fully described and responsibility for each of these functions is established.

The manual is revised as often as necessary to keep it up-to-date and it is given a wide distribution so that each man responsible for any phase of the maintenance of equipment is provided a copy. Each copy is registered in the name of the individual to whom it is issued. To reduce the cost of the manual, revisions are made and issued on a page basis and these are then distributed for insertion in the prac-

tice manual binder which is loose leaf and of a permanent character.

Suggestions for the improvement of this manual and its contents are welcomed by the committee. When such suggestions have merit and are adopted, appropriate awards are made to the employees presenting the suggestions. However, no experimentation in lubricants or procedures is permitted to be made by individuals unless prior approval of the committee is obtained.

HOW STANDARDS GROW

Standards in lubricating practices and procedures generally begin on a departmental level, gradually extend to the status of a divisional standard and finally, with the proof of time, become a company wide standard. When a company has subsidiaries, affiliates, and associated companies, a plant lubrication committee is the beginning point towards the enlargement of the company standard to an industry wide level. For this purpose selected members of the company lubrication committees of the various plants meet, generally once a year, to compare notes and discuss common problems. In time, an industry wide standard to serve the best interest of the manufacturer of equipment, producers and dis-

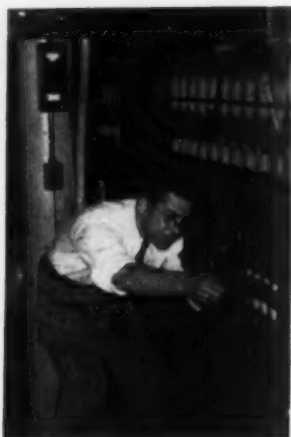
tributors of lubricants, and the operating and consuming industry may be developed.

Recognizing this trend, the American Society of Lubrication Engineers was formed about six years ago. A.S.L.E. was designed to be the common meeting ground for the researchers, the manufacturers of lubricants, machine designers, and the practical plant lubrication engineers ultimately responsible for upkeep and maintenance. The society now consists of about 2000 members throughout the United States, and it welcomes all engineers interested in better maintenance of industrial equipment through proper lubrication methods and practice.

At the present time, the only section of this organization in the South is located in Kingsport, Tennessee, the nucleus of which was the Eastman Lubrication committee. The Kingsport Section was formed about one year ago and there are now a number of representatives in this section from other industrial concerns in the area. These men meet once each quarter, at which time nationally recognized experts in various fields of lubrication lecture on particular aspects of the subject. Wide exchange of information concerning problems of mutual interest is thus developing.

The author and Mr. W. S. Moorehouse, Superintendent of Outside Services and Chairman of the Lubrication Committee, inspecting the methods of receiving, handling, and issuing lubricants.





The Camera as a Maintenance Tool

Is there a camera fan on your maintenance crew?

He and his camera can start a photo file which can become one of your most valuable assets.

WHEN a new turbine or a new compressor is installed, the plant engineer expects a fully illustrated manual. Yet, for a major maintenance job on special equipment, the men doing the job are expected to rely on memory or hearsay.

Keeping a maintenance photograph album is a simple job which does not require much time or expense, and it does not take long to build up a file of photographs of great value for future maintenance work.

What maintenance work is worth photographing? That is a question to be answered by each plant engineer. It is probably easier to point out the type of job which should not be photographed. The first type to eliminate is that for which photographs can be furnished by the manufacturer of the equipment. For example, there is no need to photograph lubrication points on a compressor when the manufacturer can furnish an illustrated lubrication manual. It is also a waste of time to photograph the obvious. No

one needs a picture showing how to drive an ordinary nail into an ordinary board.

On the other hand, such a simple operation as tightening a foundation bolt might be worth a picture if it showed the length and type of wrench and the proper setting if a torque wrench is used. Film and time are also well expended in photographing, in a group, all the tools used in a particular piping job. Next time there could be no excuse for "the plumber forgetting his tools."

Any special maintenance job is worth a picture or two. A year or ten years later, the same job can be repeated without preliminary surveys or time consuming discussions of methods to be used. Here again, a photograph of the tools used is valuable.

Taking the Pictures

In almost every plant there is a camera fan. For photographing maintenance work, it is important that the photographer know something about the job being done. Therefore, it is best to have the pictures taken by the maintenance engineer, himself, or one of his crew.

Sometimes the plant newspaper or magazine has a photographer on its staff. Unless he knows a lot about maintenance work, don't use him to take the photographs. Truly, it is much easier to teach a maintenance man to take a picture than it is to teach a photographer the main-

Special maintenance methods are worth filing for instruction of new men.



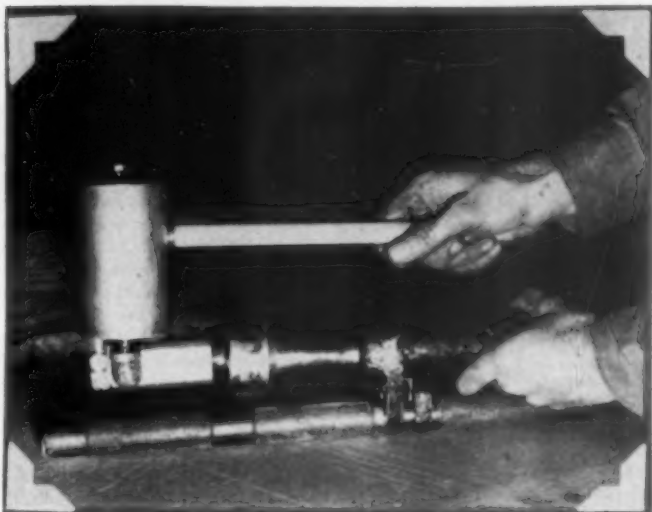
tenance job on hand. Borrow the company camera, if necessary, but don't borrow the cameraman.

Taking an indoor shot of machinery is the simplest type of job, and anyone who has used a camera at all can take good shots after a little experience. They may not be artistic, but they will be clear and will show the methods used in doing the maintenance work — which is the whole point of the picture.

The Camera

It is quite likely that the man picked as the photographer has a camera of his own. As long as it is equipped for taking pictures with a flash bulb, it will do for most of the photographic jobs. On the other hand, a camera is useful for many jobs around the plant, and it may be a good idea for the plant to buy one.

Selecting a camera is like buying any piece of precision equipment—you get just about what you pay for. The standard press camera is generally conceded to be the best for work of this type. These graphic cameras are sturdy, easy to handle, reasonably fast, and extremely versatile. They are available in three negative sizes, $2\frac{1}{4}$ " x $3\frac{1}{4}$ ", $3\frac{1}{4}$ " x $4\frac{1}{4}$ ", and 4" x 5". They range in price from slightly over \$100 to about \$300, depending on size and extra equipment. Newspaper photographers use the 4" x 5" size, but around the plant, there is no reason the $2\frac{1}{4}$ " x $3\frac{1}{4}$ " would not do just as well if not better. Furthermore, they are much lighter and the most versatile.



Photographs show how to operate special maintenance equipment such as this hydraulic roll puller for textile drawing rolls.

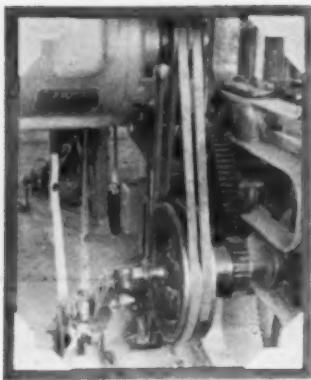
Probably the ideal camera for plant photographic work is a $2\frac{1}{4}$ " x $3\frac{1}{4}$ " graphic equipped with a range finder and a synchronized flash gun. This would cost, fully equipped, about \$150. It will use roll film, sheet film, or film packs. Everyone is familiar with roll film. Its disadvantage lies in the fact that the whole roll must be used before any one of the negatives is developed. Sheet, or cut film, is made up in packages of separate sheets designed to fit into special holders, each holder containing two sheets of film. When using these, each photo can be developed separately, immediately after it is

taken. There need be no waiting until other pictures have been snapped to use up eight, twelve, sixteen, or more exposures. On the other hand, this sheet film must be loaded into the holders in a dark room, and this is not always convenient. It is customary to load a number of holders at one time and then use them as required. This type of film is particularly convenient when doing your own developing work.

The film pack has some of the advantages and some of the disadvantages of both roll and sheet film. It comes in a pack of twelve sheets so arranged that they can be ex-

These photographs show operators how to clean spinning frames with air hose, brush and pneumatic picker.





On this loom, the drive was changed from line shaft to individual motor drives. This photograph was sent from one plant to a branch factory to show how the change was made.

posed successively as is roll film. It is also possible to unload these sheets one or more at a time in a dark room, but it is a fairly tricky job. This film is quite thin and harder to handle than sheet film when developing and printing.

The graphic camera in the $2\frac{1}{4}$ " x $3\frac{1}{4}$ " size will handle all three types of film. This makes it adaptable to any type of photographic demands which might be had in the plant.

The Darkroom

The best thing about a dark room for plant photographic work is that it is not needed; because it is possible to have all developing work and enlarging and printing done by a commercial photo printer. Merely taking the film to the corner drug store generally gets good results. However, 8" x 10" enlargements usually cost \$1.00-\$2.00, so it may be wise to invest in a little dark-room equipment if many photographs are to be made.

The most expensive piece of dark-room equipment is the enlarger. A good one which will handle $2\frac{1}{4}$ " x $3\frac{1}{4}$ " negatives can be had for less than \$100. An enlarger of equal quality to handle 4" x 5" negatives would cost in the neighborhood of \$350. Trays, stop-clocks, chemicals, dryers, and a supply of paper should run less than \$50. The only other item needed is a lightproof area equipped with running water. A large closet, perhaps 8' x 10', is ample. Then, also, if one desires to

do all of his work at night, he can get along very well without any dark room at all.

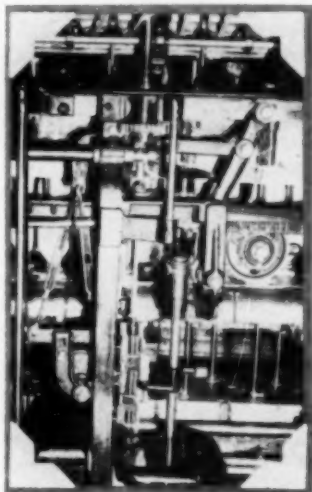
No special training is needed to print good pictures. With a little experience, any 10-year old of normal intelligence can develop film and print photographs. This is not to imply that it is easy to do portraiture work or achieve artistic or salon quality, but it is no trouble to make good working photographs for a maintenance photo manual. Again, it is more important to know what you are trying to photograph than it is to know all the details of professional picture work.

It is suggested that the photographs used in the maintenance album be all of standard 8" x 10" size. This is large enough to show detail and to make notes and draw arrows on the print. The photographs should be printed on double weight, semi-gloss paper. This type of paper can be filed in a ring binder without mounting, and semi-gloss is easier to write on with ink than is glossy paper.

While there are many ways to file photographs, ring binders are certainly satisfactory and convenient. Folders can be given titles such as: Piping, Electric Motors, Ductwork, Bearings, Lubrication, Wiring, or any other title which fits the group. These binders are then filed in the maintenance bookshelf with other maintenance manuals.

It would be an easy and pleasant task to spend upward of \$500 in purchasing camera equipment and darkroom facilities for the plant. But it is wiser to go easier at the start. Why not first find your

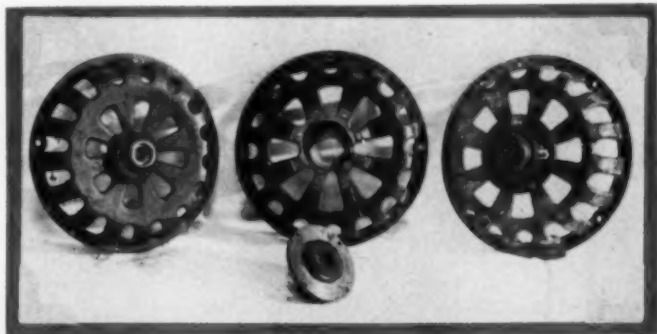
camera fan in the maintenance crew, and suggest to him the possibility of photographing the next maintenance job? Let him use his own camera and have the film developed and the prints enlarged by a commercial photo printer just as he does his own snapshots. Start your maintenance photo file, and see how much help it turns out to be. The plant's further needs in photographic equipment will soon be obvious.



A good photograph of redesigned equipment will serve as a guide in making similar changes to other equipment of the same type.

It will probably not be many weeks before you have your own plant camera and the men are talking about "our" darkroom. Give it a try and see what develops.

When new ball bearing end plates were added to electric motors, a record was made by photographing the old cover, the old cover as turned down, and the new end plate fixed in place.



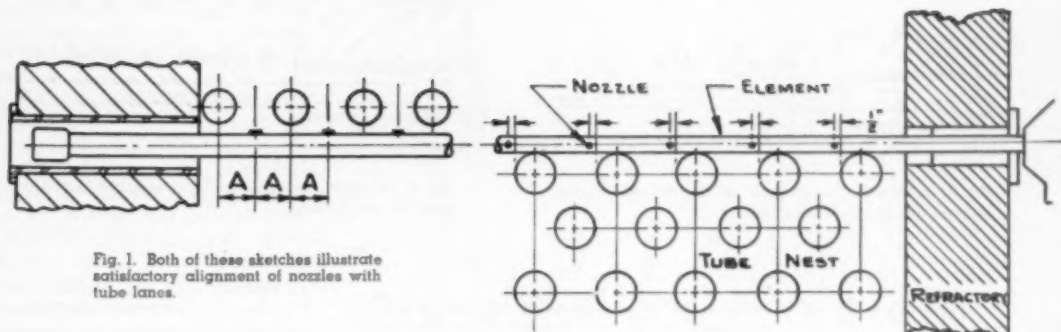


Fig. 1. Both of these sketches illustrate satisfactory alignment of nozzles with tube lanes.

Soot Blower Maintenance

By E. C. BRAUGHLER

Manager of Service
Vulcan Soot Blower Division
Continental Foundry & Machine Company

SOOT blowing, once considered a necessary evil, has become a positive necessity on modern coal- and oil-fired boilers. Fuel costs are rising, and heat value per pound of fuel seems to be decreasing. Ash, sulphur and low-fusion-temperature slags cause more trouble with lower Btu fuels and demand dependable soot blower operation.

Boiler insurance companies have said without reservation that failure to maintain soot blowers properly has probably caused more tube failures in water-tube boilers than any other factor. Unless soot blowers are properly operated and maintained, there can be lengthy and costly outages of more expensive, hard-to-replace boiler equipment.

Many cost-conscious engineers are now setting up suitable maintenance programs on soot blowers, and since peculiarities of each boiler plant usually require a program tailor-made for each plant, it is advisable to enlist the aid of the manufacturer's field service engineers in setting up a specific program. However, the following paragraphs will help bring to light the more important things to be considered.

All mechanical soot blower equipment can be broken down into three major types:

1. **ROTARY EQUIPMENT.** This consists of an element which is a specially prepared tube with nozzles for distributing steam or air to clean the boiler tubes. The element remains inside the boiler, supported by bearings or hangers attached to the boiler tubes or other internal surfaces, and is rotated about its own axis by an operating head or other outside arrangement. The operating mechanism may or may not contain an automatic valve for turning on or off the blowing medium. It may be hand operated or powered by compressed air or electric motor. Rotary units are used in cooler gas passes where the element and its supporting bearings can be economically sustained.

2. **SHORT RETRACTABLE** (sometimes called Wall Blower, Gun Blower or Deslagger). This type uses a short element lance or swivel tube that extends into the hotter boiler positions for cleaning the walls through which they are mounted. They may also be used to sweep adjacent slag screens, walls, floor or roof surfaces. Blowing nozzles at the end of the lance are withdrawn into wall sleeves for protection when not being cooled by the blowing medium. The unit includes some mechanical means of extending the lance or swivel tube into the boiler.

The tube is rotated about its axis during the blowing cycle and then mechanically withdrawn. Blowing medium may be admitted automatically or by hand. Operation may be manual or by means of air or electric-motor drive.

3. **LONG RETRACTABLE.** This type uses a lance of from three to twenty-five feet long for cleaning any pass or screen where temperatures are too high for long life expectancy of bearing-supported element placed in these fire lanes. It provides either automatic or manual turning on and off of the blowing medium, and a mechanism for extending the lance while it is being rotated about its axis. It differs from the short retractable in that it uses one or more telescopic tubes or feed lines to save aisle space. Since it is heavy and may have an operating cycle of some ten to twenty minutes, a long retractable element is always power driven by air or by electric motor.

Rotary Equipment

This type is most likely to cause tube erosion, and thus requires the most inspection, maintenance, and adjustment to keep it operating properly. If either the element or the boiler tubes be distorted and not properly positioned with relation to each other, localized scoring or wasting away will occur until the tube fails. Usually only tubes are affected, but the boiler drum can also be eroded if the equipment is not properly adjusted.

Tube cutting usually is due to the

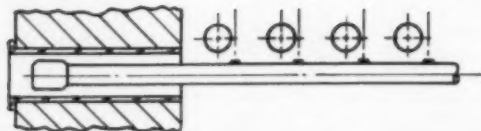


Fig. 2. Incorrect. Due to axial shifting of soot blower element, jets are too close to tubes.

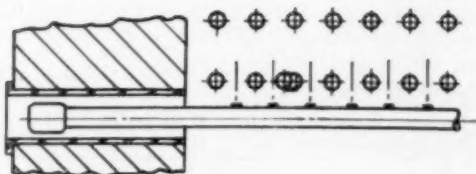


Fig. 3. Incorrect. Jet impinging on warped or distorted tube will cut the tube.

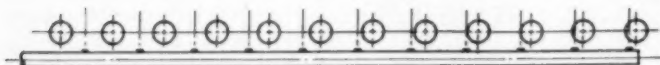


Fig. 4. Incorrect. Due to growth, nozzle is impinging on tube.

blowing medium impinging or striking directly on the surface because of soot blower nozzles being improperly placed in relation to the tube surface.

These other factors may also cause, or contribute to, tube cutting:

1. Excessive pressure causing excessive nozzle or jet velocity.

2. Abrasive dust, from baffles and sheaves adjacent to blowers, entrained in the blowing jet.

3. Condensate in steam, or water in air, whichever is used as the blowing medium.

4. In air heaters or economizers where dew points may be low or boiler gases highly corrosive, tube metal may be rusted or eaten away, especially where any condensate or drops of water from blower elements may be deposited on tube surfaces. These rust scales are removed when blowers are operated, thus exposing new metal and the cycle continues until tube failure occurs.

Internal Inspection—Rotary

1. Make an internal inspection of all soot blower equipment each and every time the boiler is out of service. Do this as soon as the boiler passes are cool enough for men to enter with comfort, so that any correction needed can be made without upsetting the return-to-service schedule. Inspection, adjustment, repair or replacement can only be done during a boiler outage.

2. Check to see that nozzles are properly aligned with tube lanes. As the unit is rotated, see that the

nozzles point into the spaces to be cleaned. Some manufacturers recommend that nozzles be set directly in the center of the lanes. Others say the centerline of each nozzle should be one-half inch from that side of the tube farthest from the head. General opinion is that both of these settings will give satisfactory results. (See Fig. 1.) However, it is advisable to follow the instructions of the manufacturer.

In checking nozzle alignment, check these points specifically:

- (a) Has the element shifted axially, in the bearing or supports? This may be caused by loss of outside operating head supports, by the boiler walls bulging or buckling, or by loose wall sleeves. (See Fig. 2.) Some slight adjustment of outside operating head supports is usually provided. If this be lacking or insufficient, it may be necessary to cut and rethread the element to shorten it, then add a nipple long enough to extend the element into proper nozzle alignment.

- (b) Are the boiler tubes in proper position? A warped or distorted tube may be forced into the path of the jet, causing impingement and cutting. The boiler tube must be corrected, or the nozzle in the element striking the offending tube must be welded shut, if failure by cutting is to be avoided. (See Fig. 3.)

- (c) Has the element "shrunk" or "grown" because of excessive heat and repeated chilling by the blowing medium? This will be observed if the nozzles are out of alignment with the tube lanes at one end of the element while in proper alignment at the other end. It is impossible to correct this. The element must be replaced. (See Fig. 4.)

3. Check to see that the sweeps

or blowing arcs are properly set. The manufacturer will gladly furnish drawings showing this general arrangement. If drawings are not available when inspection is made, good judgment can usually determine the areas which the unit is expected to clean, and verifying drawings can be obtained later.

Incorrect blowing arcs are prime factors in loss of baffles, cutting of drums and, sometimes, tube erosion. All possible care should therefore be taken to make sure they are correct. Different manufacturers use different methods of establishing this blowing arc.

Some use a cam to hold the valve open during the required cleaning cycle. This cam may require relocation, or both relocation and cutting, or a new cam if the original one has been cut short.

Others use stop pins or screws to establish the beginning and end of the arc.

Still another method uses separate opening and closing cams, which need only relocation to correct the sweep setting.

In any case, the manufacturer's service and maintenance manuals should be consulted for correct sweep-adjusting procedure.

Only one general statement can be made for the setting of all blowing arcs. Where there is a choice of starting the blowing arc, as on a unit rotating 360 degrees, the nozzles should be pointed along the tubes, or in the tube lanes along the axis of the element. Nozzle pressures are highest and condensate or moisture content the greatest when the blower unit is first opened. If the excess is dissipated in this tube lane, rather than perpendicular to the tube bank, chances of tube erosion are lessened.

Further, if this type unit is in a vertical screen, the nozzles should be

down during the "at rest" position to prevent fly ash falling through the nozzles to create a sandblast effect when the unit is operated. On an element close to the mud drum, it may be wise to point the nozzles upward while "at rest" for drum protection. (See Fig. 5.)

4. Check the nozzles to be sure they are in place and in proper repair. Nozzles may become elongated from steam erosion. After long periods of time, they may be cut out completely so that complete element replacement is necessary.

5. Check the elements themselves, to see that they are straight and true, and easily turned in their supports. Look for cracks, splits, missing end plugs or wear at the bearings and supports.

All warped or bent elements can be straightened. Manufacturers' service manuals give the exact procedure. However, these general rules should apply:

(a) All elements should be heated before there is any attempt to straighten them. Plain steel elements should be heated to a dull cherry red (about 1400 F). Calorized coated or dipped elements should be heated to a cherry red (about 1500 F). Alloy elements used in high-temperature passes should be heated to between a bright cherry red and orange (about 1650 F).

(b) Elements can then be rolled on the floor and a wooden block used to tap the bent sections. Great care must be exercised in straightening alloy elements. After exposure to boiler temperatures and cooling, these elements tend to crystallize and fracture readily if dropped or struck too sharply by another object. The best, safest and perhaps fastest method is to heat the element at the bend with acetylene, then apply leverage pressure such as an arbor press.

6. Check the bearings of the elements. See that all are present, in proper alignment, tight on their respective tubes, and in good condition. Check to see that bearings are present in sufficient number to prevent distortion and warpage by sagging between bearings when the unit is hot.

7. Make sure the proper element is at each boiler location. Manufacturers' service manuals clearly indicate how to identify soot blower elements. There is usually a position number stamped into the metal at the open, or operating head, end

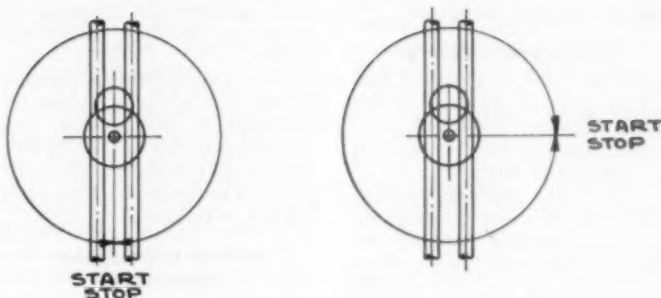


Fig. 5. Sketch at left shows correct start-stop position. Wrong installation is shown at right, with start-stop position perpendicular to tubes.

for protection in the wall sleeve.

Generally speaking, plain steel is used for elements in passes where temperatures do not exceed 900 degrees F. Calorized dipped or coated elements are used in temperatures to 1500 or 1600 degrees F. High temperature alloys are used in passes up to 1800 degrees F. If these temperatures are exceeded, high maintenance and replacement may result. If failures are persistent, it might be more economical to use the next better material or, in the case of top-bracket temperature, to replace rotary equipment with retractable blowers.

8. Observe, report and record any tube erosion, cutting or polishing that is evident in the slightest degree. The permanent record will help determine on future inspections whether the condition has been corrected.

9. Blowing pressures may be reduced on some equipment by adjusting the valve throw, on other equipment by adjustable orifices, in still other equipment by a permanent orifice in the line. Manufacturer's service instructions will indicate the proper procedure. No higher pressure should be used than that needed to clean the boiler. This decreases tube erosion, and prevents excessive use of steam or air, thus aiding economy.

External Inspection—Rotary

1. Make sure valve mountings or head supports are secure. Loose mounting permits head and element to move in and out of the wall sleeve, undoing all the careful internal alignment.

2. Check the operating head and valve to make sure it is functioning properly mechanically, and that it can rotate without undue binding.

3. See that mechanical parts are clean and free from rust. Dirt and rust act as an abrasive, causing moving parts to wear.

4. Remove immediately any and all water pockets in the supply piping system. Proper draining of piping is of prime importance. When the blowing medium is steam, the supply pipe should have an independent direct connection to the boiler drum, to obtain the driest possible steam at maximum pressure. Steam supply piping should be insulated for safety, and to reduce condensate in the soot blowing system.

5. Make sure piping connections to soot blowers are flexible enough that no leakage or abnormal stresses will develop. Proper hangers should be provided for the pipe. Pipe risers should never depend on the soot blower head for any support. This always causes binding when the unit is operated.

6. If condensate traps are used on steam systems, dis-assemble them and clean the screens during outages to make sure they operate properly. If a drain valve with 3/16-in. hole in the seat partition be used instead of a trap, make sure it is in place and in operating condition.

7. Make sure condensate is drained to atmosphere. If drains are led to blow-down tanks, check valves should be used. If drain systems are connected in series to two or more boilers, checks should be used to prevent steam from back-

ing up on unused equipment.

Maintenance—Rotary

Things listed so far have been inspection points to check during boiler outages. There are other points that can be checked while the boiler is in service.

1. Operating personnel should be instructed to report immediately to the maintenance personnel any difficulty encountered in operating.

2. Competent maintenance personnel should be required to follow and observe each and every soot blower through its operating cycle on certain definite dates. These inspection periods should be bi-weekly or monthly, depending on the size and importance of the soot blower installation to proper boiler operation.

3. All steam leaks should be corrected immediately.

4. All valves should seat tightly to prevent wire drawing.

5. All packing glands should be drawn just tight enough to prevent leakage without binding or breaking down packing fibre by excessive pressure.

6. All cams and moving parts should be cleaned and properly lubricated.

7. Gear boxes should be filled to proper levels with correct gear oils or grease. Greases should be checked regularly to see if they have hardened or separated from their bases because of high ambient temperatures. On outdoor installations, they should be checked when temperatures drop to see if hardening or channelling occurs.

8. Lubricators in air lines to air motors should be checked at least once a week to make sure oil reservoirs are full and feed is correct.

9. With electric motors, insulation, brushes and commutators should be clean and insulation free from oils. General rules for care of electrical equipment and industrial controls should be followed.

10. Where drive chains are used, unless they can be operated in an oil bath, the chain should be kept as dry as possible. Only enough oil to prevent rust should be applied. Excess oil picks up fly ash and grit to form a cutting abrasive between link connections.

11. With any lubricants, manufacturer's specifications for correct

types, amounts and frequency of application should be closely followed.

Since inspection and maintenance of both long and short retractable equipment are very similar, both are covered in this section. To save space, recommendations which duplicate those for Rotary Equipment will not be repeated.

Internal Inspections—Retractable

1. Check to see that nozzles are not worn, cracked or split. Examine inner wall sleeve edges to make sure sleeves are not breaking down under heat and thus failing to protect nozzle heads when they are retracted. See that nozzles are properly retracted for protection.

2. Examine thoroughly all tubes cleaned by these units by rubbing the hands over them to determine if there are any grooves or flat spots indicating erosion or cutting. Tube erosion or cutting with Retractable Units is invariably due to excessive blowing pressure. This pressure should be reduced as explained under Rotary Equipment. On Long Retractable Units, be careful not to reduce pressure to a point where the volume of steam passing through the lance will be insufficient for cooling the lance when fully extended.

3. On wall blowers, extend the unit and check the distance from nozzle to the surfaces to be cleaned. This distance should be that recommended by the manufacturer.

4. On gun blowers that sweep adjacent walls, floors, roofs or slag screens, extend each unit and rotate it to verify that the blowing arc conforms to that shown by the manufacturer's prints.

5. Space between water wall tubes where these lances enter is sometimes limited by boiler construction. Check to see that lances enter the center of the opening which could thus be damaged.

6. Lances should be straight and true. Straightening procedure as outlined for Rotary Equipment can be followed.

External Inspection—Retractable

1. All points under external inspections for Rotary Equipment

are applicable to Retractable Units. Retractable units are usually heavier and need more dependable motor drives. Therefore, more consistent and thorough attention should be given to motors and gear boxes.

2. Be careful when mounting long retractables. Where outboard bearing or boiler end of the unit is supported and attached to the boiler, only one other point should be attached to structural steel. The boiler will move under heat and load. Thus, if more than one point is attached to steel structures, twisting and binding of the unit will occur with boiler load changes.

3. All units of this type have some sort of telescoping tube or feed line running through or over a packing gland. Surfaces passing through these glands should be clean, smooth and free from burrs, cuts or scoring. If they cannot be cleaned, they should be replaced to prevent excessive packing replacement or damage to mating parts.

4. It is sometimes necessary to relocate soot blower units or add additional equipment to relieve troubles or reduce maintenance. This, as well as a question of change in design, should be deferred until all possible sources of trouble have been eliminated. Soot blower manufacturers are glad to lend their know-how to such cases.

Preparing for Outages

Where boilers are subject to extended outages, as in heating plants, maintenance can be reduced by giving proper attention to the equipment before and during the down period.

1. Moving cams, etc., should be well coated with rust-preventive lubricants.

2. Mechanical units should be covered with canvas, oilcloth or paper for protection against moisture or excessive dust.

3. If operating valves or pistons have rings or parts not made of rust-resistant alloys, these parts should be removed. They can be protected by a rust inhibitor or stored until the equipment is required.

4. Where feed lines or telescope tubes are of carbon steel, the units should be extended and rust preventive applied to these parts.

5. Inspections and repairs should

be made immediately when the boiler is shut down to assure proper operation when the boiler is put back into service.

Care, adjustment and maintenance of automatic control panels for automatic-sequential systems is properly entrusted to the instrument personnel. Such systems usually require little care after being placed in service, except to keep all parts thoroughly clean.

Generally speaking, they require the same maintenance as any industrial control system, except that the loads on relays, indicator lamps and switches are comparatively light, therefore, requiring less attention. Little maintenance trouble is met if this type equipment is kept clean and free from dust and oil.

Operation

Correct operating procedure will help minimize maintenance problems. These are important check points:

1. Drain valve should be fully open, and supply valve opened slowly, during warm-up period. Drain valve should not be closed until the steam leaving the drain is absolutely dry. Drain valve should remain open when units are not operated. These precautions prevent condensate from entering elements

to warp or distort them.

2. Rotation of elements should be slow, even and continuous from the time steam flow starts until it is shut off. Should the automatic valve-in-head unit fail to shut off, the entire system should be shut down immediately, and the offending unit be corrected or blanked off before proceeding with the other units in the cleaning cycle. To proceed with the other units after one operating head has failed to shut off would cause tube damage. In addition, there would be reduced blowing pressures to the other elements which would prevent proper boiler cleaning.

3. All units should be kept in operating condition as far as possible. Loss of one unit could cause plugging and thus divert hot gases over an adjacent unit to destroy that element.

4. Blowers should be operated in proper sequence along the gas flow lanes with drafts fully open. This moves soot out, rather than blowing it from one place to another. Boiler load should be $\frac{3}{4}$ to full, if possible, to prevent puffs or possible explosions.

5. Blowers should be operated at proper intervals to reduce temperatures and prevent loss of elements and nozzles. Operating intervals

should not be set for certain hours of the day or shift, unless the boiler steams very evenly and neither soot nor slag conditions are of much concern. Blowing intervals should be adjusted to load, firing and fuel conditions. The guiding rule is that flue gas temperature should not rise more than 35 F between soot blower operating periods.

Soot blowers should also be operated after any abnormal fuel burner operation resulting in heavy smoke while burning oil. This is especially true if there is an economizer or air heater.

Soot blowers are expected to clean efficiently and safely. They are intended to operate at low power and labor costs, and to give long life with minimum maintenance expense. This is possible, even if the equipment be subjected to high temperatures and adverse operating conditions.

Soot blowing engineering takes these points into consideration and uses the highest possible engineering standards in design and construction. As a result, blower equipment properly installed and cared for is as trouble-free as possible. To maintain this standard of operation requires only a regular program of inspection and preventive maintenance.

New Plastic Protective Coating

THE new air-drying plastic protective coating of U. S. Rubber Company is used to protect tanks, tank cars, pipes, fittings, structural steel parts and chemical processing equipment against attack by splash, drip and spray from corrosive chemicals, corrosive atmospheres, weathering and rust.

It is expected to find its broadest use in chemical processing, rayon and cellophane production, photo finishing, pulp and paper manufacturing, sewage disposal, filtering and electroplating and in mining operations. It cannot be used in food processing because it imparts a slight odor and taste.

The plastic combines high film flexibility with good adhesion and impact resistance. It is applied

by spray, allowing one hour drying time between coats and 24 hours drying time after the final coat. It requires no primer and can be produced in a variety of colors. Since it contains no chemical plasticizer to leech out or harden, it retains its flexibility throughout its service life.

A sharp instrument will cut through the film but the break can be repaired easily by "touching up" with brush or spray. Metal should be grit or sand-

blasted before the coating is applied, cement should be etched with hydrochloric acid, while wood and composition board needs rough sanding to assure a good bond.

Sample metal plate coated with U.S. Rubber Company's new air-drying plastic protective coating is squeezed in vise to demonstrate its high film flexibility and good adhesion qualities. Coating will neither chip nor crack and can be used on steel, aluminum, concrete, hardwood or composition board.

blasted before the coating is applied, cement should be etched with hydrochloric acid, while wood and composition board needs rough sanding to assure a good bond.



Embrittlement in Welded Boilers

By **HARRY M. SPRING**

Chief Inspector
Mutual Boiler and Machinery Insurance Co.

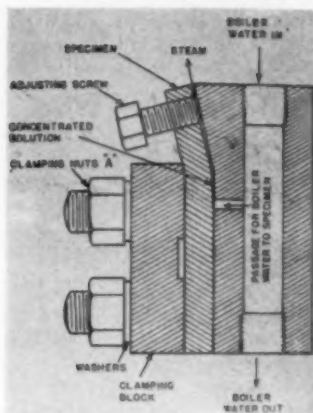
CAUSTIC embrittlement was probably more argued during the first half of this century than any other defect in steam boilers. Most engineers operating in that era and alive today recall how the subject became so debatable during the 1920's and 1930's that the U. S. Bureau of Mines then co-operated in a study of the problem. Soon after, the Schroeder Embrittlement Detector was developed. This permitted determination right on the job as to whether the boiler water could cause embrittlement cracking.

A number of the leading feed-water laboratories joined the battle and before long it was more or less decided that the sodium sulphate-sodium hydroxide ratio recommended for a number of years by the A.S.M.E. was not proving out as well as had been originally thought. Controlled dosage of sodium nitrate has since

become the more accepted treatment.

During the same period of double-barrelled attack, the manufacturers of boilers turned to a new method of fabricating shells and drums—namely welding instead of riveting. Although this came about as a result of economics and demands for construction suitable for elevated pressures, many believed it the solution for embrittlement cracking. Elimination of the stress concentrations ever present with riveted construction led to this belief.

It is true that there is some stress concentration in tube ligaments, but it is of a measurably lower magnitude. To the writer's knowledge, there has never been tube ligament cracking positively identified as caused by embrittlement. It is possible to occur, however, in an unorthodox design, if the tube holes are so closely spaced



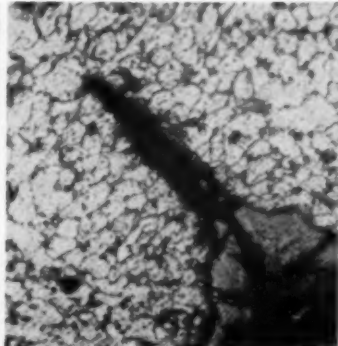
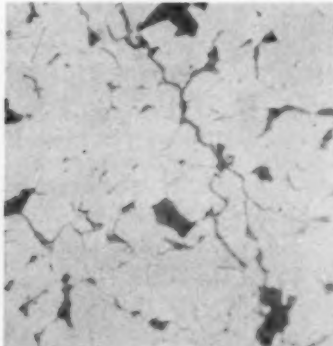
The Schroeder Embrittlement Detector consists of a strip of boiler steel prestressed to a magnitude that permits accelerated determination of the embrittling character of the boiler water. Adjustments are made so that boiler water circulating against the stressed portion of the strip escapes by minute, controlled leakage. This builds up the concentration of salts and simulates leakage past a boiler joint.

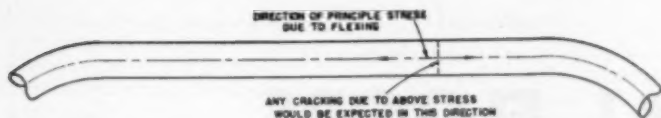
with respect to their diameters as to approach the diameter-pitch ratio of a riveted joint.

Embrittlement cracking is occurring in welded boilers. It is not in the drums but in the tubes themselves.

Where is the factor of high magnitude stressing? It is in the portion of the tube forming the rolled or expanded joint. As with a crack in a drum or shell, the cause may be fatigue or embrittlement. A tube between two brick-bound drums may flex or bow excessively each time there is a change of temperature. The stressing may occur

Cut two specimens, one from each end of the crack. The intercrystalline crack in the center micrograph denotes embrittlement. Transcrystalline crack at the right indicates fatigue.





midway in the length of the tube or it may occur in the rolled joint due to the pivot effect. Naturally the principal stress will be in the direction of the long axis of the tube and crack will be at 90 deg to this. (See illustration.)

Let us see then, how to go about proving the cause of such a crack. If the crack is not in the rolled joint where it is possible for the second factor for embrittlement*—concentration of salts—we may safely discard the embrittlement possibility. If the crack is in the rolled joint, once again we should adopt a double barrelled approach. First, install a Schroeder Embrittlement Detector under the direction of some reputable feedwater laboratory experienced in its use. This is to find out whether the boiler water as being treated could cause an embrittlement crack.

Then the cracked tube end should be cut with a hack saw or by drilling out to obtain a small specimen including the root of the

crack as it progresses from the water surface to the fire surface. It is necessary to trace the progress of the crack with respect to the grain structure to obtain a conclusive answer. The specimen is then mounted in a bakelite or plastic mold and polished to a mirror finish. The metallurgical laboratory procedure used in many laboratories, including that of the Mutual Boiler and Machinery Insurance Company, is to file the face of the specimen smooth, then polish it with emery papers from No. 1 down to No. 000. At each change to a finer grade of paper, the specimen is turned 90 deg so as to remove all scratches from the preceding coarser grade.

The specimen is then polished further by two grades of soft cloth with very fine abrasive mounted on a rotating disk. A "mirror finish" results. This is then etched lightly with a Nital solution (5% nitric acid, 90% alcohol) to develop the grain boundaries so they

will be visible under a metallurgical microscope. If the path of the crack follows the grain boundaries, the crack is caused by embrittlement. If the crack cuts across the bodies of the grain, it is fatigue due to repeated over-stressing. It is possible for the water to affect a fatigue crack and accelerate it by corrosion. A fatigue crack broadened and undoubtedly accelerated by corrosion is illustrated. It should be noted that the crack is still trans-crystalline, having no respect for the grain boundaries.

It is possible for a crack to show evidence of both inter-crystalline and trans-crystalline progress. It may start as an embrittlement crack, then, if water conditions are corrected it will halt its inter-crystalline progress. If, however, the crack has gone far enough to cause structural weakness and high stress, the crack may progress as a fatigue crack. Such cracks are known as "sleeping cracks" usually hidden and undetected until they progress far enough to manifest themselves by leakage.

**Except hydrogen embrittlement, which is rather rare and not covered by this article.*

Special Sling for Fork Trucks

HERE'S a handling idea which can be used by anyone that needs to handle large awkward machinery. The idea requires no extra equipment but adds to the usefulness of existing handling equipment. The special sling described here is used for handling heavy odd shaped equipment by fork truck.

The sling comprises a piece of chanel iron secured to the upper surfaces of the forks by "L" shaped bolts; a hook attached to the center of the chanel supports two heavier chanel welded back to back and equipped with three chains for attaching to the load. Two of the chains (with special hooks) hang from the extremities of the heavy chanel and support the load at either side. The third chain (centrally located) supports the front of the load and prevents it from swinging downward.

This handling device, in conjunc-

tion with the Yale fork truck, simplifies an extremely difficult handling problem. The truck not only transports equipment from production to testing and back to

assembly, but also raises and lowers the load for accurate positioning.

Ideas such as this can save time and extra handling and add to the usefulness of present equipment when installed with forethought.



INDUSTRIAL FLOORS

Part I



By **RAYMOND B. SEYMOUR**

The Atlas Mineral Products Co.

Floors joined with a carbon filled polyurethane type cement in a large rendering room in a meat packing plant.

Principal types of industrial floors—advantages of each type. Selection and installation. Part 2 will deal with jointing materials (cements) for tile and brick floors.

FLOORS are one of the most important parts of any structure and yet until recent years, almost 50 per cent of all industrial floors were inadequate for the service intended. Because home owners insist on both beauty and durability, residential floors are usually satisfactory. Residential floor coverings alone often cost more per unit area than complete industrial floors and yet this differential is not typical for other phases of industrial and residential construction. The very existence of this anomaly indicates that insufficient attention has been given to industrial floor design and construction.

Construction Details

In every floor design, proper attention must be given to the possibility of settling and seasonable variations in the ground water level, frost line, etc., as well as vibrations resulting from railroad

or truck traffic or machinery within the building, and expected loads. In too many instances, failures resulting from improper design are attributed to construction or material failures. Industrial floors having a factor of safety of one usually fail because of unexpected settling, vibrations, or heavy loads. For example, the fluctuations resulting from filling and emptying a 5,000 gallon tank within a building may be sufficient to cause structural failure of an under-designed floor.

Floor Surface

Whether or not the floor surface over a properly designed sub-floor will be satisfactory depends to a large extent upon the service to be encountered. Many floors are subjected to the constant traffic of carts or trucks, some of which are equipped with improperly designed wheels which may ruin an otherwise satisfactory floor. Other floors

are completely disintegrated by materials such as sugar, animal, vegetable or mineral oils, milk, beer, fruit juices, soda pop, detergents or ice cream. Sometimes floor construction that would not be acceptable for a residential lavatory is erroneously considered adequate for chemical process or textile plants. Many buildings fail because of inadequate attention to proper floor design.

Most floor failures can be attributed to a lack of knowledge of good design. The National Safety Council (5) recommends that the floor and foundation should be designed to bear at least four times the anticipated stationary load and six times the anticipated maximum moving load placed on it, but many floors do not meet these specifications. Any standard text on strength of materials would serve as a guide for the design of the sub-floor but design information on industrial floor surfaces is not readily available. This article has been written in an attempt to overcome this deficiency.

A satisfactory floor surface must be free from nails, bolts, holes, splinters and other projections. It must be dry, low in heat conductivity, durable, and easily cleaned.

In addition, it must be adequately resistant to the direct or indirect chemical action of any solid, liquid or gas to which it may be exposed.

Types of Floors

Some industrial floors that have been considered satisfactory are earth, wood, metal, cement, wood or cement protected by mastics, cement admixtures, magnesite, terrazzo, linoleum, rubber, and plastics or brick or tile joined with appropriate materials.

Earthen Floors

Earthen floors were formerly considered adequate for foundries and crude processes but because of the many uncertainties associated with such construction, earthen floors are seldom found in modern construction even on the ground level.

Wooden Floors

Wooden floors are satisfactory for warehouses, some textile departments, and operations conducted in the complete absence of moisture. But wooden floors are usually more expensive than other types of industrial floors. Plank floors are fairly resilient and noiseless but splinter easily and warp and become slippery when wet. Some of the objectionable characteristics of plank floors have been overcome in part by the use of creosoted wood blocks (1).

Metal Floors

Steel plates and gratings are used only in special cases. However, there are many portions of floor areas where steel gratings are essential. Limitations are high cost, smooth surface, and high conductivity.

Concrete Floors

Concrete sub-floors are almost universally acceptable in modern construction. They are structurally sound and can be readily designed to provide suitable grades and levels. However, in spite of endless attempts to prepare admixtures or surface hardeners, concrete is usually unsatisfactory in the presence of fruit juices, sugar, milk, beer, soda water, vinegar or ice cream. It is likewise attacked by all acids, strong alkalies and salts as well as by mineral, vegetable and animal oils (3, 13, 14).

Some plant engineers have overlooked the surface attack of concrete on the assumption that corrosion resistant floors were too expensive. These engineers probably did not recognize that the initial cost of a non-resistant floor plus the cost of maintenance is many times the cost of a properly designed floor. In addition, because of the porosity of concrete, the attack by corrosives is not limited to the surface. Steel reinforced concrete structures have been com-

pletely destroyed by fruit juices even though the attack appeared to be merely superficial. Of course, the odor of disintegrating food products such as milk, beer, and fruit juices cannot be tolerated by health officials or customers and, if for no other reason, corrosion resistant surfaces are essential.

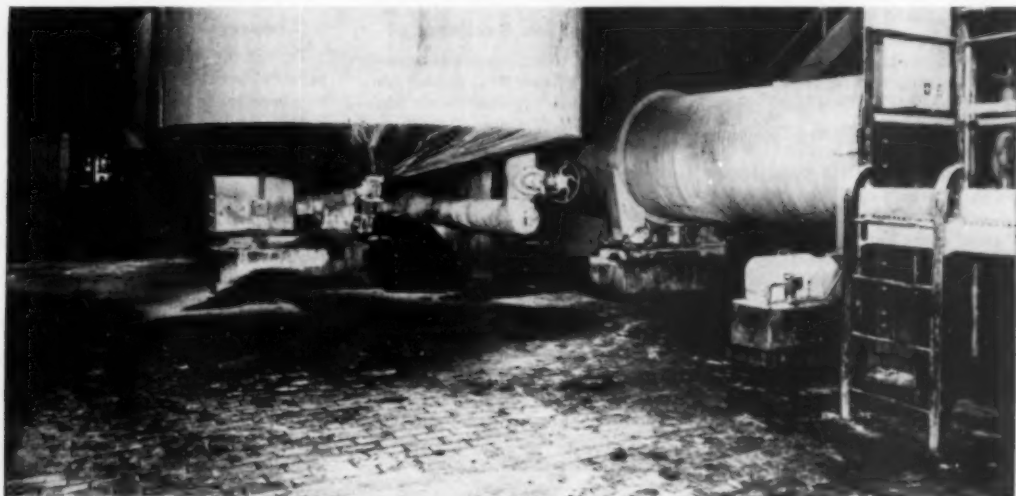
Admixtures and Hardeners

The addition of sodium silicate or calcium salts to Portland cement will minimize surface dusting and the treatment of concrete surfaces with powdered gypsum, sodium silicate, aluminum sulfate or magnesium fluorosilicate will harden the surface (2). The incorporation of iron or copper filings, silicone carbide or alundum in concrete yields a denser cement but none of these treatments yields a product that is resistant even to fruit juices. High alumina cements, blast furnace slag cements and pozzuolanic cements are said to be more resistant to weak acids than Portland cement, but this is a matter of degree rather than kind (4).

Magnesite and Asphalt

Magnesite floors, prepared by the addition of fillers to a water solution of magnesium oxide and magnesium chloride, possess greater resistance to abrasion than Portland cement or its admixtures, but the product used is corrosive in itself and is not resistant to acids.

Industrial floor joined with a carbon filled phenolic cement in a modern phosphate plant.





Plasticized sulfur cement jointed floor in a modern felt mill. Courtesy Atlas Mineral Products Company.

Magnesite floors are even less resistant to alkalis than Portland cement, but are often used for decorative industrial floors.

Some floors are often covered with asphalt, plastic, rubber tile or linoleum and while these products are satisfactory for office and warehouse floors, they cannot be considered as practical materials for most industrial floors.

Asphalt is often applied to industrial floors as a hot melt or as a mixture of Portland cement and an asphalt emulsion and sand. Asphalt compositions have considerable merit for patching broken concrete floors and because of their light weight find considerable use in repair work.

There are many proprietary products based both on asphalt solutions and asphalt emulsions and obviously the serviceability of floors constructed from such materials depends both on the quality of the products and on the workmanship associated with their installation. Asphaltic products are not satisfactory in the presence of solvents, greases, oils, fruit syrups or most acids but properly applied asphaltic floors are suitable for water and alkaline service.

Rubber Latex-Cement

Troweling compositions prepared from aluminous or Portland cement mixed with rubber latex have excellent adhesion to most sub-bases. Floors prepared from such compositions have fair resilience and good water resistance

but are not satisfactory in contact with acids. This type of floor is used to some extent in England and other European countries, but due to high labor costs of installation, has not been widely accepted in this country. Latex-cement floors can be obtained in many colors. Since they are trowelable compositions, they can be used on intricate surfaces and no unusual problems are encountered when such materials are applied on drains, sumps and pits. In recent years, attempts have been made to use latices of synthetic rubber or plastics in place of rubber latex and while these compositions show promise, they, of course, have the drawbacks of any troweling type composition.

Protective Coatings

Since corrosion resistant protective coatings are well known, engineers often wonder why such cannot be used on floors instead of brick or tile. Properly selected and applied coatings are definitely serviceable, but present a maintenance problem. A minimum of four to six coats of the highest quality products are required to secure a pinhole-free surface, but in the presence of traffic, such coatings can be considered as temporary protective measures only. However, in areas where there is little, if any, foot traffic, properly applied coatings have stood up as long as 18 months without the application of additional coats.

Considerable research has been

done on the problem of coatings and many promising compositions are now undergoing practical tests. It is safe to assume that some of the newer materials will serve for many specialized applications, but properly joined brick or tile will likely be the standard floor construction for some time to come.

Brick and Tile

Properly joined hard-burned shale or fire clay brick or tile will meet practically all requirements for a satisfactory floor. Such brick are not affected by any acid except hydrofluoric acid and are resistant to all but the strongest alkaline solutions. The selection of the size of brick or tile depends upon the type of physical service encountered. Likewise, the type of jointing material needed depends upon the corrosive conditions that are associated with the process or processes to be used.

Regardless of what jointing material is used, the sub-base must be designed to withstand all settlement, vibration and loads and all levels and slopes must be maintained as part of the subfloor. It is difficult and uneconomical to correct mistakes on levels by adding varying amounts of mortar above the sub-floor. Since the sub-floor is somewhat porous, it must first be protected by a waterproof membrane. If a properly-selected heavy asphaltic membrane is used, the sub-base will be protected from both water and corrosive solutions.

Impervious Membranes

Before the application of an impervious membrane, the concrete sub-base must be given a troweled finish and all loose particles brushed from the surface. The contour of the brick floor will follow closely that of the sub-base so that irregularities such as low or high spots will result in an irregular floor. The floor should be pitched about $\frac{1}{4}$ " per foot to all drains and gutters.

In practically all cases, a primer coat should precede any membrane application. For best results, it is preferred to brush-apply the primer. In all cases, the primer must be allowed to dry before subsequent coats are applied. Neither the primer nor membrane should

be applied on green concrete.

One of the most satisfactory and most universally accepted corrosion resistant membranes consists of an asphaltic-type primer followed by a hot melt asphaltic composition. The latter is applied with a straight edge in several steps in order to obtain a $\frac{1}{4}$ " thickness. Since the product is resilient, thermoplastic, and tacky, it cannot be used as a final surface. Even before the application of the subsequent brick or tile, the asphaltic layer must be dusted with finely ground silica to prevent it from sticking to the bricklayers' feet.

A more serviceable and slightly more expensive corrosion resistant membrane is obtained by reinforcing the membrane described above with woven fiberglass. If materials that will attack the asphalt membrane are expected to be present on the floor, the membrane may be further protected by coating with properly selected aqueous dispersions of plastics to give a completely resistant surface.

An experimental membrane that is completely resistant to all solvents, alkalis, salts and most acids can be constructed by reinforcing furfuryl alcohol type cements with woven glass fabric.

Such membranes are rigid and lack the resilience of standard membranes. Sometimes they are applied above the asphaltic membrane in order that there may be a cushion to withstand vibration and mechanical shock.

Types of Brick and Tile

Extra heavy duty floors are composed of $3\frac{3}{4}$ " thick brick joined with a properly selected cement. These are suitable for heavy trucking and have given excellent service in steel plants and heavy equipment manufacturing plants. Heavy duty floors are composed of $2\frac{1}{4}$ " thick brick joined with properly selected cements and are suitable for moderate trucking. Such floors have been used for over ten years in chemical plants, textile plants (12) and plating room floors (9).

Light duty floors are composed of $1\frac{3}{8}$ " thick tile joined with a properly selected cement and are suitable for foot traffic and splash and drainage of corrosives associated with food plant floors, dairies, ice cream plants, etc. Food plant tile floors are sometimes constructed from $\frac{3}{4}$ " thick quarry tile or $1\frac{3}{8}$ " floor tile joined with the properly selected cement.

Thinner quarry tile is available but since a minimum depth of $\frac{1}{2}$ " cement joint is required, it is essential to use a tile that is at least $\frac{3}{4}$ " thick. Many hundreds of food plant tile floors have been installed in breweries, dairies, distilleries, and canneries. It should be emphasized that the size of the brick or tile recommended depends upon the physical service conditions that are to be encountered in the floor service.

Part 2, in the June issue, will list the available jointing materials and discuss their respective merits for various applications.

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Sprinkler Equipment Maintenance

By W. HUGH BACHE

Crawford Sprinkler Supply Co.
East Point, Ga.

Sprinkler equipment is your plant's first line of fire defense. Such mechanical equipment requires attention. Here are impairments most commonly encountered and suggestions for elimination.

THE record of sprinkler equipment—satisfactorily extinguishing or controlling approximately 90 per cent of all fires generating sufficient heat to open a head—is a tribute to the excellent maintenance and inspection it usually receives. However, a large part of the 10 per cent unsatisfactory performance can be traced to impairment of the equipment—not through intentional neglect—but through failure of management to realize that it is

mechanical equipment and as such requires its share of attention.

In the following the impairments most commonly encountered, and suggestions for their elimination are outlined. If any seem elementary or extreme, pay particular attention—they are the ones most likely to create your greatest hazards.

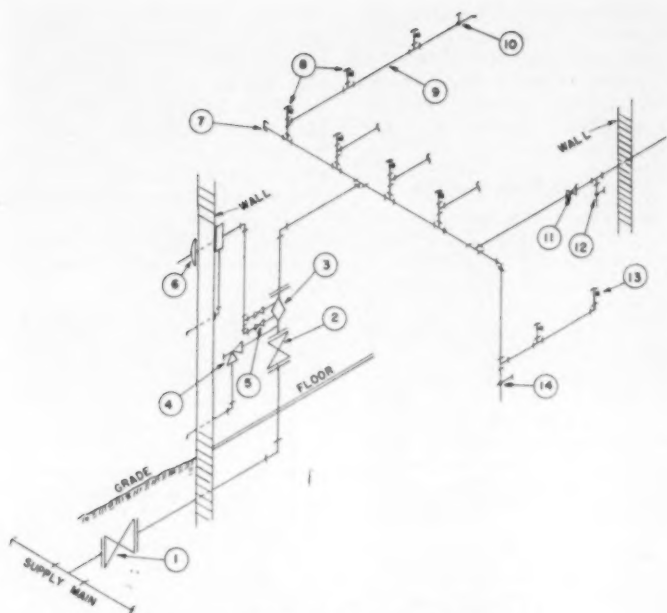
Valves

Of primary importance to the proper functioning of any sprinkler

equipment are its valves. Without them, the flow of water cannot be controlled. To use them properly, responsible men must know where they are, what purpose they serve, whether they are open or shut, and what state of repair they are in.

All this seems obvious, yet in the past year alone the following conditions have been called to our attention:

A sectional control valve that couldn't be closed because its disc



Diagrammatic Sketch Showing Elements Requiring Maintenance and Inspection

- | | |
|----------------------------|---------------------------------|
| 1. City Valve | 8. Sprinkler Heads |
| 2. System Control Valve | 9. System Piping |
| 3. Dry Pipe or Alarm Valve | 10. System Test Valve |
| 4. System Drain Valve | 11. Sectional Control Valve |
| 5. Alarm Test Valve | 12. Auxiliary Drain for Section |
| 6. Water Motor Alarm | 13. Trapped Heads |
| 7. Flushing Connection | 14. Auxiliary Drain |

had been removed and never replaced.

A city valve which had been shut for six months before it was discovered that no water was on the system it controlled.

A post indicator valve that indicated the "open" or "shut" position of the indicator, but failed to indicate the "open" or "shut" position of the valve because the indicator extension stem was not connected to the valve stem.

Other valve hazards could be cited, but these serve to illustrate what can happen. In each case heavy repair bills had to be paid. In all of them serious fire hazards were created, and the hazards were all the more serious because the conditions of the valves were not known to those who would have been called upon to use them in an emergency.

The question was recently raised,

"Is there any way to test a sprinkler head to determine if it is in working order without destroying the head?" The answer was no—but experience has proven such a test would rarely be necessary. If the reliability of certain heads are suspected, sample heads can be tested and judgment passed on the basis of their performance.

Heads do require attention, however. When installed under low ceilings or exposed to mechanical damage, they should be protected by guards.

A head that has been subjected to a freeze or mechanical damage of any kind should be examined thoroughly and replaced if there is the slightest evidence of damage.

The proper "degree" heads should always be installed. It is desirable to use 165 degree heads wherever possible because a head with too high a temperature rating is unnecessarily delayed in its operation.

On the other hand, higher degree heads may be required in boiler rooms, attics, skylights, or other locations where abnormally high temperatures exist. When in doubt, approved thermometers should be used to check the actual temperature at the point of installation.

When used in corrosive atmospheres, the heads must be lead or wax coated for protection.

Heads must not be painted as paint may impair their operation. Plated and other special heads are available to serve decorative purposes.

Sprinkler Devices

Each different make of dry pipe valve, alarm check valve, and accessory equipment has its own peculiarities. Consequently, the best advice that can be given when setting or maintaining them is to carefully follow the manufacturer's written instructions. A copy of these instructions should be mounted on the wall close to the device. Even if the man generally looking after the equipment doesn't need them, some one else who gets caught in an emergency might. In any event, the interior of the device must be thoroughly cleaned when placing in operating condition to make sure that no grit or sediment obstructs the free movement of the parts.

Audible Alarms

The importance of the audible alarms provided with sprinkler equipment is readily appreciated when one considers the damage likely to occur if the operation of the system is not discovered immediately. Sprinklers may control the fire for a reasonable length of time, yet still require help in its complete extinguishment. Or water damage may be excessive if the supply is not shut off promptly.

To test these devices, each alarm check valve or dry pipe valve is equipped with a by-pass connection to the alarm device which permits its operation without disturbing the rest of the system. No maintenance program can be complete without such periodic tests.

Frozen Pipes

One of the greatest threats to sprinkler systems is freezing, and

careful design and maintenance are necessary to prevent it. Where the system is entirely within heated buildings the wet pipe system is employed, but for unheated areas the dry pipe system is essential. As the name implies, the wet system operates with the piping constantly full of water. But the dry system is so arranged that a small compressor keeps the piping full of air until the system is called on to operate. Then the air automatically escapes and water is forced in.

The problem of frozen pipes was very much in evidence this past winter. In some instances it was necessary to shut down plant operations for costly repairs to burst pipe and fittings. In others, there was water damage through failure to discover the break in time. One plant was completely burned because the sprinkler system, badly damaged during freezing weather, was never repaired. Others could have been destroyed if fire had broken out while some unsuspected pipe was clogged up with ice, making it impossible for water to reach the open head.

Dry pipe systems are by their very nature most susceptible to freezing if not given proper attention. Dry pipe valve closets must be provided with sufficient heat to prevent the water in the riser from freezing. This usually requires only a 100 watt light bulb burning in the enclosure, but without it the protection is gone.

The piping of dry systems must also be thoroughly drained after each operation of the system. While this is generally done in order to replace fused heads, it sometimes happens that low points that do not drain back to the main drain valve are overlooked. These same low points also accumulate condensation as a result of cooling of the compressed air, and for that reason must be inspected and drained frequently in cold weather. All low points are provided with a drain connection for this purpose.

On older dry systems it is advisable to check the grade of the pipes to make sure they will drain as intended. Adequate grade may have been provided when the system was installed, but settling of the building, sagging of the roof, loose

hangers, or damage to the piping may have altered it.

Wet pipe systems are of course only installed in heated buildings. A sudden temperature drop over the week-end, however, may cause freezing if steps are not taken to get the heating system into operation at once.

Obsolete and improperly operating heating systems can give trouble and should be modernized or repaired.

In a few cases, heating systems have been abandoned entirely with no thought being given to protection of the sprinkler equipment. This is most likely to occur when a portion of a building originally used for manufacturing purposes and containing a wet system is converted to other uses normally requiring no heat. When this circumstance arises, and it is found uneconomical or impractical to maintain heat, it would be well to consider the possibility of converting to a dry system.

The main point is not to run the risk of frozen pipes, and after every freeze an intensive inspection of the sprinkler equipment should be made—regardless of whether it is wet or dry.

Clogged Piping

It is sometimes difficult to understand how rocks, sediment or other debris can get into sprinkler piping to the extent that it can cripple or shut off the flow of water. That this can and does happen is recognized by the insurance companies by the requirement that every system be equipped with an inspector's test connection at the highest and most distant point in the system. By opening this connection it can be determined if a sufficient flow of water is available. With dry systems, it also provides a check on the time required for the dry valve to trip and for the water to reach the connection.

The significance of this test was demonstrated recently when we were called on to run a trip test on an old dry pipe valve. When the test valve was opened, we didn't even get a flow of air although there was 20 pounds air pressure on the system. A 1½ auxiliary drain valve was then opened and still no air was released. Investigation revealed that

the branch line to the test connection was completely clogged with small rocks and sediment, and that mud had filled the drain connection. How long such a condition had existed, no one could guess. We do know, however, that about a week later after the system was flushed out and put in proper order, a fire broke out that was quickly extinguished by the operation of a single sprinkler.

Alterations

It is not unusual to find additions and alterations to buildings accompanied by haphazard extensions to the sprinkler system. The result—improper location and spacing of heads, overloaded systems, undersized piping, and a long tortuous friction laden path for the water to follow. As many as twelve heads, for example, have actually been found installed on a ½-in. pipe, whereas the minimum size permitted for just two heads is 1-in.

To avoid such pitfalls and save the expense of tearing out a costly homemade system and having it replaced with one which will meet the underwriters requirements, call in a reputable sprinkler contractor when changes are contemplated. The installation of automatic sprinklers is a trade in itself and should be trusted to none but those experienced and skilled in that trade. Consultation with sprinkler experts will guarantee you the protection you require at minimum cost. Often they can show you where a minor modification in building plans can save a great deal in the cost of the sprinkler equipment.

Air Pressure

A common headache with dry pipe systems is their failure to hold air satisfactorily. To start with, it should be stated that not all systems can be expected to be 100 per cent tight. If a system requires pumping up once every week or so, that is no cause for alarm. Where more frequent attention is required, it will generally be found that a little piece of pipe scale or other foreign matter has become lodged under a valve seat, or that a drain or test valve has not been closed tightly and plugged.

When a system that has not

operated for a year or more suddenly begins to lose air, check all the valve packings. They become dry through lack of lubrication and if a valve is operated for any reason it is probable it will leak unless the packing is tightened.

In lieu of a thorough check for air leaks some operators have solved their problem by putting twice or even three times the normal air pressure on the system. Thus they

have to pump it up only one-half or one-third as often. This practice is a major DON'T in equipment maintenance. Air doesn't put out fires. The more air in the system the longer it will take to get it out when a sprinkler operates, and the more headway the fire will gain before water reaches it.

Conclusions

Most large plants enjoy the ad-

vantage of regular periodic inspections of their sprinkler equipment by the insurance companies. Those that don't, should arrange for such inspections by qualified sprinkler companies. In the present state of national emergency, the rebuilding of destroyed plants is becoming more difficult and expensive, and the construction of some types of building is entirely prohibited.

Safeguarding Fuel Hose

WHERE a fuel hose is used to make delivery from distributing main to the power unit, life of the hose can be greatly extended if it be relieved of pressure—if not actually drained—between periods of use.

If the shut-off valve is at the point where the hose is attached to the pipe system, there is a chance

of leakage or loss when the hose is released or watch on the engine tank filling procedure relaxed.

If the valve is in the end of the hose, quantity control is simplified, but the hose remains charged and under pressure at all times.

One power user, employing portable diesel-electric units for emergency lighting and welding cur-

rent, equips the fuel lines with two valves, one at each end of the hose. The valve at the end of the hose is used to control flow into fuel tanks, and permits closure with a minimum of loss. The valve in the supply pipe feeding the hose is then closed, and the hose cleared of pressure by opening the outermost valve and permitting the pressurized fuel to flow into a container. If the period between fuelings is to be extended, the hose is drained into the container, and coiled.—ELTON STERRETT, HOUSTON, TEXAS.

Product Improvement Cuts Installation and Maintenance Costs

New finish for glass block facilitates cleaning: identification stripe facilitates laying.

A gold stripe (arrow) on the top mortar-bearing edge now makes it easy to lay Insulux light-directing glass block in the correct position. Improperly installed blocks can quickly be detected; when a course of block is laid correctly the gold stripe is continuous, if not, it is broken.

Cleaning panels is simplified by new finish applied to exposed faces during manufacture. Water-repellent finish prevents adhesion of mortar, eliminates need for acids generally used for cleaning masonry work. Insulux glass block is produced by American Structural Products Company.



Choose the Right Piston Ring and Cut Costs

By R. W. HOYT

Chief Engineer
Double Seal Ring Company
Fort Worth, Texas



A sealing tongue prevents blow-by through the end gap of this sealing type piston ring, manufactured by the Double Seal Ring Company of Fort Worth, Tex.

THE ring's size is almost infinitesimal alongside that of the entire power plant. But a recent survey of more than 100 diesel engine operators showed that inefficient compression rings in a 2000-hp plant could cost as much as \$5,000 in one year—in fuel waste.

Several engine "evils" which are blamed, often rightly, on piston rings must be considered: 1. Poor starting and power performances. 2. Excess fuel and lubrication oil consumption. 3. Crankcase explosions. 4. Scored cylinder liners and pistons. 5. Cracked liners and pistons.

The two most common engine problems which cause operators to want new piston rings are:

1. Loss of power (which conversely means excess fuel consumption).
2. Excess consumption of lubrication oil.

These are the symptoms of ring inefficiency which usually become apparent first.

What to Buy?

After considering all the operating problems he wants to eliminate by installing new rings, the operator's next step is to decide just what and how to order.

At first glance, this would appear quite a task—in view of the wide variety of piston rings available (in both the oil control and compression families) and of the

fact that piston ring lands and cylinder liners are continuously changing through wear.

Selection of the "right" rings from the number of types to be had requires that the selector have wide knowledge of the performance qualities of all the ring types and be able to decide which would be most likely to solve the problems which beset a specific engine. The ring experience of the average operator usually does not equip him to do the best selection job.

So, more and more, wise operators are calling upon reputable ring manufacturers, who have extensive ring experience, to prescribe the proper ring setups for their engines (or pumps or compressors).

But even the operator who makes his own considered choice—on the basis of his own ring experience and performance records—usually is better off than many of his colleagues.

This is because an all-too-prevalent practice among operators is merely to place an order for a set of piston rings exactly the same as were last installed in an engine. This may be wrong—a procedure which invites inefficient engine operation to "make itself at home" along with the new rings.

Your engine has changed since you last installed rings. The changes might mean your engine

needs different types of compression and/or oil rings—perhaps different sizes of rings.

Side Clearance

As a result of several years of close observation of ring replacement problems, we have come to the conclusion that probably as many as 50 per cent of all replacement rings are installed with improper side clearance, particularly in the top groove. Hammering of previous rings against the groove during engine operation has caused wear of the bottom side of the groove.

The amount of wear may be small (perhaps only .002 inch) but it probably is much more. Too, the hammering often causes a shoulder to wear in the groove (see Fig. 2). This shoulder prevents a new ring from operating properly. Unfortunately, wear of this sort often is not considered in the ordering of new rings. The general practice when ordering new rings is merely to state, for example: "One set of rings for a Model VA De La Vergne." Or perhaps the order will specify: "40 compression rings, 15x $\frac{1}{2}$; 10 oil rings (ventilated), 15x $\frac{1}{2}$."

With such limited information, the ring manufacturer receiving the order has no recourse but to supply rings suitable for the engine as it was when new. In fact, he very likely refers to the engine manufacturer's blueprint for the

original ring specifications and fills the customer's order accordingly.

Chances are the new rings will work, of course, but certainly not with the same efficiency as would have resulted from installation of a ring setup prescribed with full consideration of changes in the cylinder liner, piston and ring grooves.

For instance, installing new rings which leave excess ring-groove side clearance means more side clearance will appear more rapidly. In a four-cycle engine, a ring in a "sloppy" groove will hammer with greater force because it has more room to move "up" and "down." In engines with aluminum pistons, we have seen the width of the top groove enlarge as much as .040 inch in a few months because of improper side clearance.

Excess side clearance and the groove wear which has caused it mean that a compression ring does not seal against the bottom side of the groove as quickly or as completely as it would if the groove side were flat and square and side clearance was not excessive. This in turn means more compressed gases are permitted to escape from the combustion chamber, wasting fuel, lowering power output and fouling cylinder-piston lubrication.

We think all operators should start a campaign to make sure that their piston ring grooves are in proper condition when new rings are installed. Ring grooves in which shoulders or other irregularities have developed should be machined out, leaving flat, smooth surfaces. This machining, of course, will increase the width of the groove and necessitate installation of a wider ring than was removed.

Ordering new rings, therefore, the operator should specify the new groove sizes (in decimals, not fractions) and let the ring manufacturer determine the proper side clearance between each ring and groove.

It is best for the operator to send along a sketch (see Fig. 3) showing the groove sizes, types and arrangement. This will help the ring manufacturer do a better

job of prescribing and making proper rings for the specific engine.

Sealing Type Rings

Important to be considered in selecting replacement rings is the condition of the cylinder liner. Is the liner out-of-round or tapered? If either condition exists, it is wise to consider installation of sealing type compression rings (see photograph).

A tongue at the end joint of this type of ring seals the ring gap—preventing blow-by of compressed gases. The tongue continues to seal the gap fully even as the ring expands to compensate for liner taper or expands as the ring wears to a seat in an out-of-round liner.

The gap of the plain (non-sealing) compression ring, on the other hand, provides an open avenue for blow-by even when the ring is new, and in an unworn liner this gap widens with liner or ring face wear and permits compression loss at an ever-increasing rate.

The engine survey referred to earlier in this article revealed that, as cylinder liners tapered from .000 to .010 inch per inch of cylinder diameter, the average engine, when fitted with plain rings, performed as follows:

1. Lost power-output-per-fuel-unit efficiency more than seven

times faster than when fitted with sealing rings.

2. Lost compression through blow-by more than 26 times faster than when fitted with sealing rings.

Even when cylinder liners were new in both the sealing-ringed and plain-ringed engines, the average engine with sealing rings did the following:

1. Developed about three per cent more horsepower hours per gallon of fuel than did the average engine with plain rings.

2. Was more than twice as efficient in stopping compression blow-by than the average engine with plain rings.

The survey revealed, then, that sealing type compression rings did a markedly better job than did plain rings even when cylinder liners were new and plain ring gaps were opened only their minimum width.

But it was as cylinder liners tapered that the sealing rings showed their really remarkable advantage as compared with plain rings.

These survey results illustrate how changes in an engine can give rise to a need for different compression ring setups—if optimum engine economy is sought.

Complete Data

Similarly, well-prescribed oil ring replacement can help solve

Fig. 2. Shoulder wear.

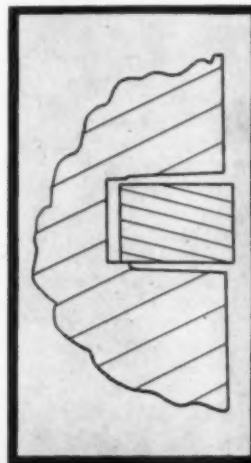
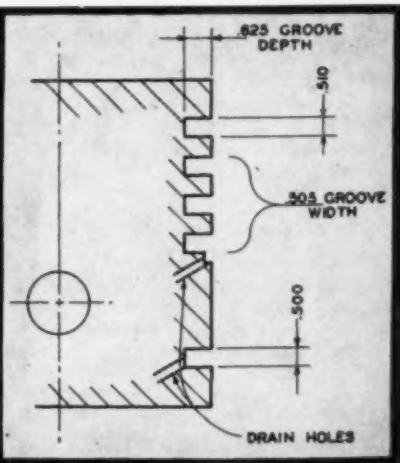


Fig. 3. Sketch helps define ring needs.



lubrication problems—excess oil consumption, insufficient cylinder wall lubrication or other.

The operator should be sure to give all information necessary for the ring maker to recommend an efficient ring set up. Included should be complete data on other engine operation problems, as well as specifications on engine type, size and so forth.

At our plant, we have made a specialty of replacement ring business and therefore have spent a lot of time building up a very complete file on piston ring performance in thousands of different sizes and types of engines, compressors and pumps. In the engine group are data on gas, gasoline, diesel and steam engines of all designs and sizes.

Such a file of information is an invaluable "stock in trade" to a ring manufacturer, for he must base his recommendations to customers mainly on "case histories."

But, of course, before the manufacturer can tackle a ring replacement task properly, it is important that the operator provide all engine information which is vital in consideration of new rings.

Maintenance Welding "Routine" in West Texas Shop

THE repair of machine parts by maintenance welding can in many cases extend the service life of those parts almost indefinitely. Using a little welding rod and some imagination, parts can be repaired over and over again.

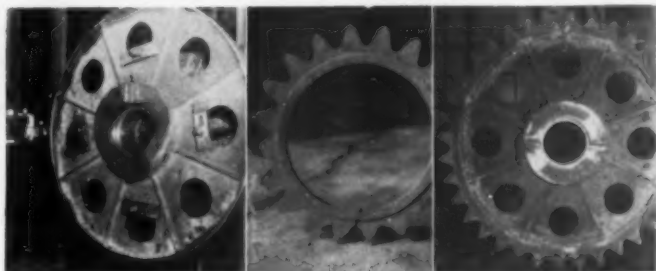
In the shop of the Magnolia Petroleum Company, in the center of the west Texas oil field, certain welding maintenance jobs are done so frequently that they are referred to as "standard operations."

When the teeth of cast steel sprockets become worn they are cut off and replaced. The old teeth are machined off and the OD of the web is turned down to give a snug fit with the ID of a new tooth rim. The cast steel rim is then heated and shrunk onto the web.

In machining the web a bevel is cut on the OD so that a Vee groove is made on both sides of the sprocket between the rim and web. This groove is welded with three passes on each side. A 5/32" Lincoln "Fleetweld No. 5" electrode is used for the first pass, the electrode size being increased to 3/16" for the final two passes.

The illustrations show the cutting off of an old rim, a new rim and the completed repair on the sprocket.

Another maintenance welding "standard operation" is the simple build-up of worn cast steel catheads. These catheads become worn from the spinning line used to spin drill pipe together. The one shown here was not worn as badly as some are and only re-



Worn teeth are turned off on the cast steel sprocket as shown at left, and a bevel is cut on both sides of the web. The new cast steel tooth rim, center, is heated and shrunk onto machined web. Then the rim is welded to web with three passes on each side, as shown at right.

quired five pounds of electrode to build it up. It was built up to size with a medium carbon electrode, "Hardweld 50." Welding time was approximately four

hours. No preheat or post heat was used.

After turning down to size, the cathead is ready for service.—*Courtesy, Lincoln Electric Co.*

The cathead has been restored to size with five pounds of high carbon weld metal. After machining to size it will be ready for service.



HOT STICKS

132,000 volts can flash out and strike like lightning—yet trained men work it hot and maintain good safety records. "Hot Sticks," the tools of the trade, have been developing for years. Handling techniques continuously improve.



A long handled fist—the claws of this hot stick are laid across the line, and the operator closes the fingers by twisting the long rod.

THREE feet away, 132,000-volt transmission conductors carried 55,000 electrical horsepower steadily over the three wires. Yet four nonchalant young specialists took those wires off their insulators, lowered the wires about ten feet, replaced a lightning-damaged cross-arm, hooked the hot lines back to the insulators, and came down the 55-foot poles for lunch. All while the current was uninterrupted.

132,000 volts is so much, that no one ever makes more than one mistake monkeying with it. If you get closer than 18 inches to a line that hot, it is not unlikely

that an electrical arc will flash right over to your body like a bolt of lightning seeking the nearest conductor.

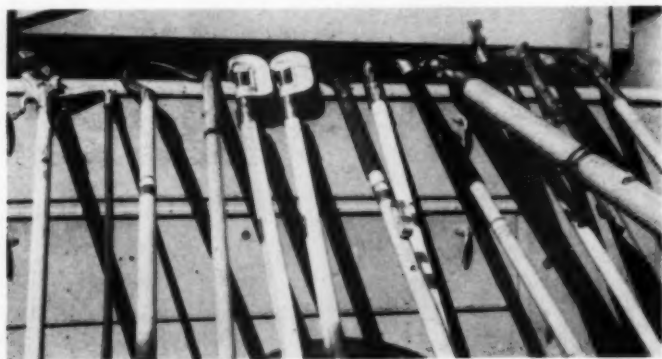
Hot Stick Tools

The reason the four young men could make a major maintenance repair job on this Carolina Power line without cutting off the juice was because of their special tools, appropriately called "hot sticks."

A hot stick is simply an extension of a lineman's hands, specially treated for complete insulation, and provided at one end with highly specialized hooks, movable clamps and other con-

trivances. They are of various sizes, weights and designs, because they do different jobs. The point is that they keep the lineman at a safe distance from the wire, and, if he is skilled in their uses, he can perform many jobs which otherwise would call for a shut-down of power.

Hot sticks will not do every electrical line job. But when you see a crew deftly lower three hot wires of such respectable voltage, install a 500-pound piece of timber between two uprights, and restore the lines to their proper position, you will admit that hot sticks are remarkable contrivances. Carolina Power and Light



Dozens of different working heads give the hot stick amazing versatility. Here are a few types—tyers, cutters, lifters, etc. The handles are made of specially treated laminated wood and they provide insulation of around 75,000 volts per foot. In other words, if the lineman's hands are four feet down the pole, he could work with 300,000 volts. But he always uses an extra safety factor—a few extra feet of stick.

Company is training all its line crews—some 300 or more men—in the skillful handling of modern hot sticks.

Not a New Tool

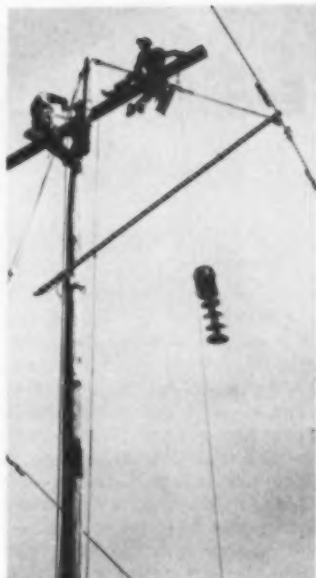
The hot stick has been developing for years, and the technique of handling it has also been constantly improving. Formerly, it was the policy of CP&L to allow its own lineman to work on "hot" wires only up to 5,000 volts, where rubber gloves, rubber hose, and rubber blankets provided insulation. Any maintenance work on voltage above that figure ordinarily called for an interruption in service, although some of the more experienced linemen and foremen did use hot sticks.

Training the company's crews in this new type of work is mildmannered Roy Anderson, an Alabamian who has some 25 years of experience in high voltage work. For some time he was demonstrator for a hot stick manufacturer, but

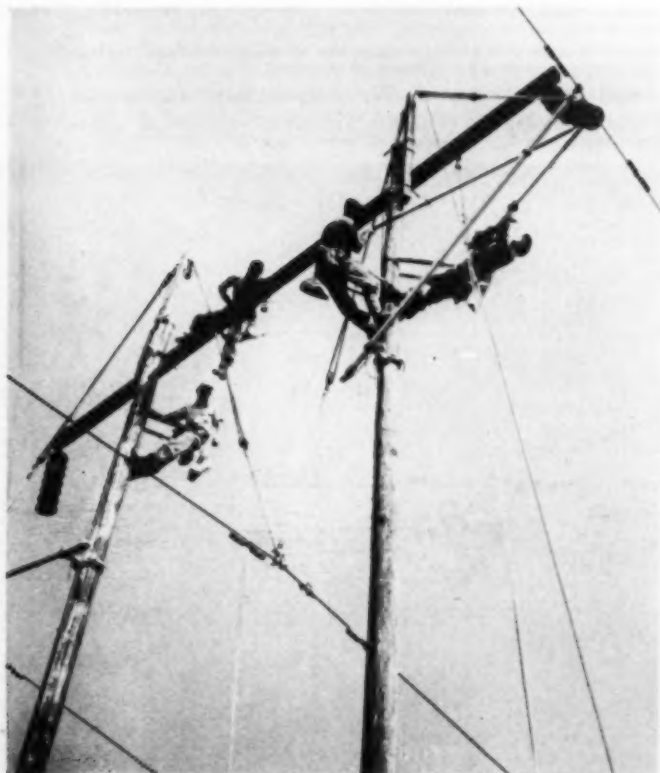
now he is a real "perfesser," except that his classrooms are the lofty reaches of transmission poles and towers.

Anderson briefs his climbers almost in whispers, illustrating his instructions with sketches drawn in the sand beneath the towers on which they are about to work. Once they are aloft, he squats at a vantage point and watches closely the progress of the work. "Bill," he says, "pull that handline up a little slower. It's swaying a little close to the conductor." Or "Jim, move around to the other side of the pole."

There's no monkey business either aloft or on the ground when this is going on. All eyes are turned upward. The hot stick makes contact, a sizzle from the line warns of its power. Aloft, one lineman helps his partner pass his safety belt around an obstruction. Groundmen are quick to hoist tools and equipment. Almost all of the talk is about the



Quickly disconnected, the insulator is lowered to the ground. Meanwhile the hot sticks hold the live conductors in the clear.



job — not tense, but acutely relevant.

Within three hours, the rotting cross-arm is replaced, and the young men are back on the ground. No power user missed a minute of service.

"The trouble with this story," grumbled the photographer, "is that those fellows are working up too high to get any good close-ups." "Well," said the foreman, "you could put on some hooks and a safety belt and climb up with them."

The photographer all but dropped his camera.

"Man," he said, "have you gone stark crazy? Me and those sizzling wires?"

Two linemen, using special hot sticks, disconnect the heavy voltage line from its insulator. The line by natural gravity is then lowered (slacking off on the tackle) ten feet below the working area. Each step in the program is preplanned, and rigged so there will be no slips, no swaying ropes or conductors—no one too close to the hot wires. Note the absolute dependence the linemen place on the hooks (climbers) and the safety belt.

Evaporator Survey Improves Vapor Purity

By R. S. CAUSEY

Supt. of Plant Atkinson
Georgia Power Co., Atlanta, Ga.

AMONG the various difficulties which have been experienced in the steam water cycle of the steam power plant, that of obtaining a make-up water approaching distilled purity from the evaporator appears to be most difficult. Because of the requirement for steam purity in the high pressure plants, the matter of carry-over from the evaporator is of prime importance. With this in view, a survey was made to determine the best operating procedure of the evaporator to obtain a vapor low in dissolved solids and gases.

Plant Atkinson has four single

effect, submerged coil evaporators. The two latest additions, one completed in 1945 and the other in 1948, are used to supply the normal required amount of make-up for the station, which consists of four 60,000 kilowatt turbines.

Operating individually, each of the two evaporators is capable of producing 20,000 pounds per hour of vapor to its respective boiler feedwater deaerating heater. The coil steam for each evaporator is supplied from the first stage extraction of its respective turbine. An open tray type deaerating feed preheater heats the raw evaporator

feed to 219 F. A vapor condenser cooled by the preheater inlet water recovers the heat in the vented vapor.

Raw water for the evaporator feed is taken from Atlanta's public water supply. Because of the low value of dissolved solids, approximately 35 ppm and an average total hardness of 14 ppm, chemical treatment was not considered necessary for either the evaporator feedwater or evaporator brine.

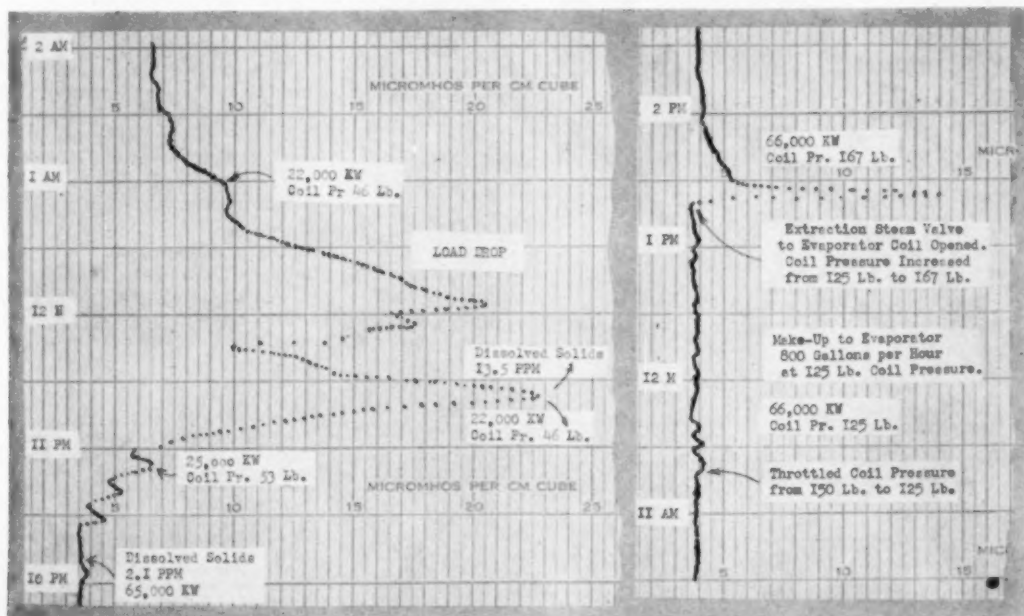
Approximately 35 per cent of the dissolved solids in the raw feed consists of dissolved silica, in the form of SiO_2 , ranging from 10 to 18 ppm. The evaporator brine is blown down and the coils are "cracked" once each 24 hours in order to keep the total concentration of the brine well under 1000 ppm.

After numerous tests for dissolved oxygen in the evaporator vapor and

Figs. 1 and 2. Sections of conductivity charts made during study of evaporator operating procedures. The multiplier for converting chart readings to dissolved solids is 0.6 (uncorrected for gases).

Fig. 1, at left, indicates that dissolved solids in the vapor vary, depending upon the amount of change in rating.

Fig. 2, at right, shows that reducing steam to the evaporator by throttling the vapor discharge does not improve quality of vapor, but give indication of possible surging or priming of the brine within the shell.



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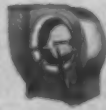
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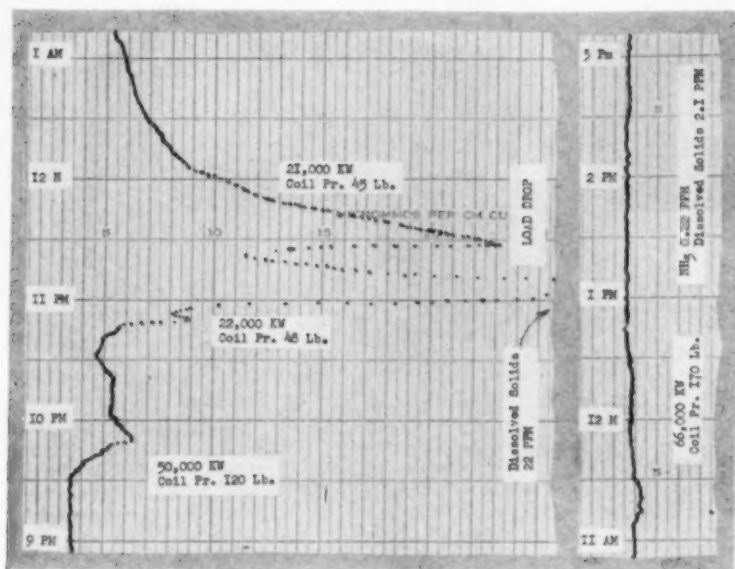


Fig. 3, left. A change in turbine rating produced a more pronounced effect on vapor purity than any other operating condition.

Fig. 4, right. Best results were obtained with the evaporator and turbine both at full rating.

the preheated raw feedwater from the deaerating preheater, it was found that degasification was good when the evaporator had been operating continuously. Whenever the evaporator was placed in service from a standby condition, however, or after the routine blow down and coil cracking cycle, oxygen determinations proved that a large amount of air was entering the system for periods of thirty minutes to one hour. This condition was corrected by changing to a continuous source of supply for steam to the evaporator preheater, i.e., to the second extraction turbine steam.

This assured a continuous supply of degased raw feedwater through the preheater during the initial filling of the evaporator shell, independent of the evaporator shell pressure. In addition to this, the vent at the evaporator shell was changed from the side of the shell to the vapor off-take. This vent is open during the entire filling procedure, when bringing the evaporator in service, and remains open until approximately two-thirds operating shell pressure has been attained. After making these changes, the amount of air found in the evaporator vapor is negligible.

Evaporator Operation

The usually accepted method of

improving evaporator vapor has been to operate the evaporator at reduced rating by throttling the steam supply to the evaporator coils. Although we have never found this true, a survey was made.

Conclusions

The rate of evaporation should be allowed to remain proportional to the turbine rating within certain limits. When the rating on the turbine remains fairly constant from one-half to full rating, the evaporator vapor appears lower in dissolved solids. Any increase or decrease in turbine load rating will affect the quality of the vapor. The amount of the dissolved solids in the vapor will vary depending upon the amount of change in rating (See Fig. 1). Any change in the rate of evaporation brought about by throttling the steam supply to the evaporator coils or by throttling the vapor discharge does not improve the quality of the vapor, but does give indication of possible surging or priming of the brine within the shell (See Fig. 2). A change in rating at the turbine produced a more pronounced effect upon the vapor purity than any other operating condition (See Fig. 3). Best results were obtained with the evaporator and turbine at full rating (See Fig. 4).

Recommendations

1. When conditions permit, the rate of evaporation should be free to correspond to the rating on the turbine, provided the following conditions are met:

- (a) The turbine load is from half to full rating.
- (b) The rating on the turbine is fairly constant.

2. The evaporator should not be operated when the turbine is at minimum rating or when the turbine is dropped from full to minimum rating unless other plant conditions make such operation essential.

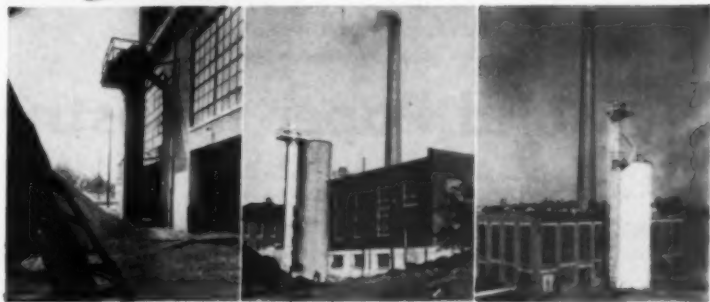
3. Equip the evaporator with a vapor conductivity recorder and a reliable level controller for the feedwater.

4. In the designing of new evaporators and redesigning of existing equipment, much thought should be given to obtaining good vapor quality at all ratings. In addition, more consideration should be given to arranging station design so that evaporator operation is not affected by turbine load changes.

Since operating the evaporators in accordance with the above recommendations, the rate of boiler water blow down has decreased, due to the lower values of dissolved silica in the boiler water.

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Maintaining Electrical Equipment in the Pulp and Paper Industry

THE electrical equipment from the generators through the switchgear, distribution lines, transformers, controls, motors and lighting must have continuous, systematic inspection. This is necessary if it is to be maintained to give necessary performance to insure continuous plant operation. Inspection alone is not sufficient but must be backed up with inspection records, recording the condition of component parts of each piece of equipment. In this way failures can, in most cases, be anticipated and prevented before they actually occur.

The following schedule starts with the generators of the system, lists component parts, catalogs what parts to check and inspect, tells what type of record to keep, and shows how often inspections should be made.

Generators

BEARINGS—Check hourly and log the temperature of each bearing. Complete internal inspection should be made every 12 or 18 months. A record should be kept of every bearing replacement. Vibrometer readings should be taken and recorded weekly of each bearing on the top and sides. This will give an indication of possible internal trouble with the rotating element. This also applies to the exciter.

WINDINGS—Check temperature hourly and record. Megohm-meter readings should be taken and recorded every 12 or 18 months. Internal inspection every 12 or 18 months. Thorough cleaning and painting of windings if megohm-meter readings and visual inspection indicate it to be necessary.

AIR GAP—Check and record space between rotating element and stator, every 12 or 18 months.

OIL LINES—Inspect daily for leaks and thoroughly clean the system every 12 or 18 months.

BRUSHES—Check daily and record any changes.

Switchgear

GENERATOR PANELS—Records should be kept hourly of the following: kilowatts, amperage, voltage, frequency, power factor and field excitation amperage. Kilowatt load on the generators should be kept at machine rating unless high system power factor will permit additional kilowatt load without exceeding rated amperage of the machine. In no event should the field excitation of the generator exceed machine rating. The power factor of the system should be maintained at or above the generator rating. Unity power factor will allow the generator to carry a kilowatt load equivalent to its kva rating.

FEDER PANELS—Records should be kept hourly of the following: kilowatt load, amperage, integrating watt-hour meter readings and power factor. The amperage load should not be allowed to exceed the rated carrying capacity of the circuit. Power factor should be maintained at generator rating or better. Wattless current should be eliminated from all feeder circuits where possible.

By N. H. MAILHOS

Superintendent of Power
Brunswick Pulp & Paper Company
Brunswick, Georgia

MAIN BREAKERS—Check every 12 months. See that moving parts are kept free and operable and free from dust and lint in the case of air breakers. For oil breakers, the breakdown point of oil should be checked every 12 months, and if it drops to a predetermined low the oil should be filtered or replaced. Make sure that all mechanical adjustments are within the manufacturers recommended allowances.

OVERLOAD RELAYS—Check settings, making sure that they function at desired rating. This should be done at least every 12 months.

VOLTAGE REGULATORS—Check and clean every 12 months.

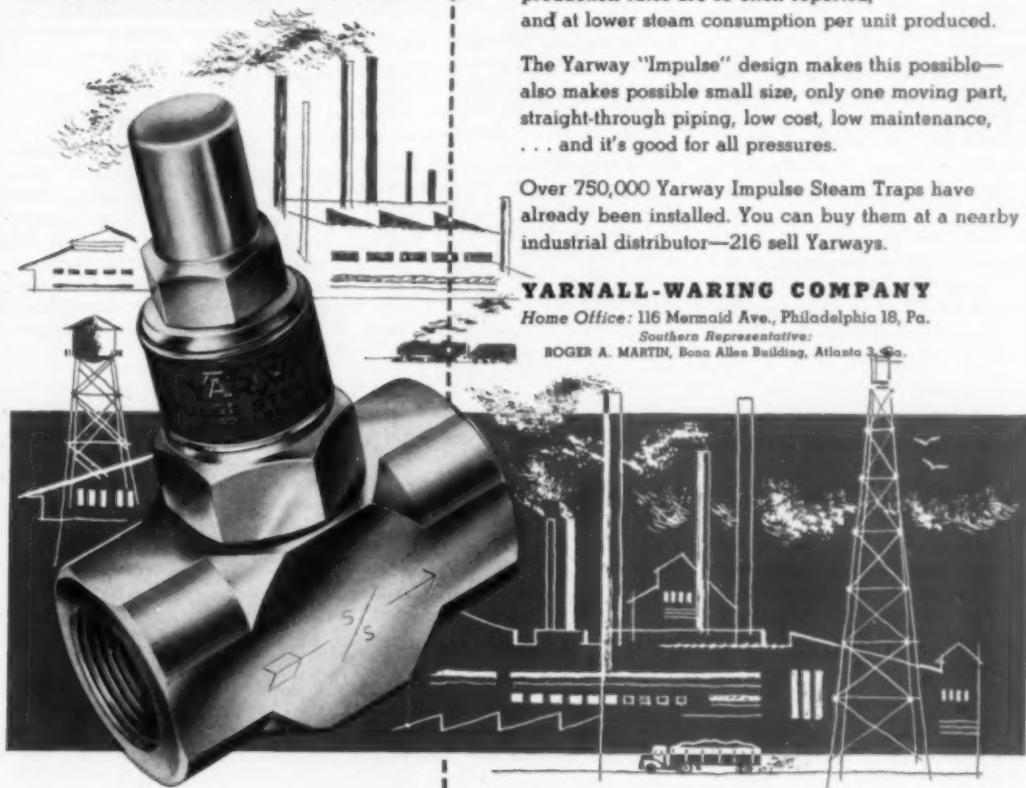
RELAYS AND METERS—Check current differential relays, watt meters, ammeters, frequency meter, power factor meter, voltmeter and integrating watt-hour meters every 12 months.

Electrical Distribution

PRIMARY CIRCUITS—Take and record megohm-meter readings every 12 months. Any appreciable drop in readings indicates that trouble is developing and the circuit should be brought to normal immediately.

TRANSFORMERS—Take and record megohm-meter readings every 12 months. Breakdown test of transil oil should be made and recorded every 12 months. Filter transil oil when breakdown voltage drops to a predetermined minimum. Thoroughly clean bushings at least every 12 months. Record tempera-

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ture readings weekly. Excessive temperature is indicative of either an overloaded condition or internal trouble. If possible, provide one kva of transformer capacity for every connected horsepower. Your transformers will then never be overloaded and maximum life can be expected from the windings.

Controls

GENERAL—Controls should be checked at least every 90 days, more often if required to operate excessively for the following: Condition of blow out coils. Contacts (stationary, moving, and auxiliary) should be clean and free of pits and burrs. Check all bolted connections for tightness. Check contactor coil and armature. Make sure that the moving parts are free and no binding is present at bearings or against arc shields. See that arc shields are in perfect condition. See that the controls are clean, free of dust and lint. Where possible, a record of all the above items should be kept on each control.

OVERLOAD RELAYS—See that proper relays are installed for the motor they are protecting, keeping in mind the ambient temperatures in which the motor and controls are operating.

Motors

RECORDS—A separate card should be kept for each motor in the plant. These cards should record all technical data on motor data nameplate. Space should be provided for recording the following data: Periodic megohm-meter readings every 3 or 6 months. Air gap spacing between rotor and stator. Winding data information—number of coils, physical dimension of coils, pitch of coils, wire size, number of turns per coil and type of connection. Motor load at various rates of production. Power factor at various loads. Ratio of gears, and output rpm. Name of equipment motor drives. Diversity factor. Diameter and length of shaft. Key size.

CATALOG NUMBERS—Record catalog numbers of: coils for motor, inboard bearing, outboard bearing, endshields, brushes, brush holders, gears (if gearmotor).

VOLTAGE—Proper voltage should be maintained at the motor terminals at all times and motor should be loaded to rating as near as possible. Underloaded motors give low power factor, and overloaded motors give shorter life.

BEARINGS—Check visually every day for proper lubricant.

YEARLY CHECK—Complete internal inspection, clean and paint yearly—more often if megohm-meter readings so indicate.

Plant Lighting

RECORDS—Cards should be kept on all lighting cabinets carrying the following information: type of panel, number of circuits, load on each circuit, main breaker rating, branch circuit breaker ratings with their catalog numbers.

CLEANING—Lamps and fixtures should be cleaned every 90 days.

CIRCUITS—Wiring should be tested with a megohm-meter every 12 months.

LUMENS—The illumination in every Department should be checked and kept at the proper level for the type of work being performed there.

Conclusions

In summary, adequate replacement parts should be kept on hand for all electrical equipment. This requires a considerable cash outlay but is definitely good insurance. No matter how excellent your mechanics and electricians are, they cannot give you good maintenance without the proper tools and repair materials.

Silicone Windings for Severe Motor Service

COST conscious maintenance men throughout industry now specify Silicone (Class H) Insulation to keep hard working, critical motors on the job.

Case 1

Here's a typical example from the steel industry. A cupola crane hoist motor insulated with the best Class B materials failed 22 times in 1098 days. Average life was only 50 days; rewind costs alone amounted to \$3,634.

Then National Electric Coil Company rewound the motor with Class H (Dow Corning Silicone bonded and impregnated) Insulation at an extra cost of only \$79. That motor,

still in good condition after 613 days on the hoist, was transferred to the trolley bridge. It's still in service after a total of 1521 days.

Case 2

A large manufacturer of automotive parts uses four of these machines to bore and face check valve seats for hydraulic tappet lifters. It takes less than 30 seconds to perform the necessary 5 operations. After each cycle or about 105 times an hour, the 5 hp, 3600 rpm motors used to drive these machines are stopped by applying direct current to the windings. That steps up production, but it raises hob with ordinary motors.

In this service, Class A insulated motors lasted from 2 days to 2 weeks or an average of about 8 days. That amounts to something like 32 failures per year per motor. Each failure cost at least 3 hours of down time plus \$80.00 for rewinding with Class A materials. At this rate, it would have cost the manufacturer \$10,000 a year to keep the four machines operating.

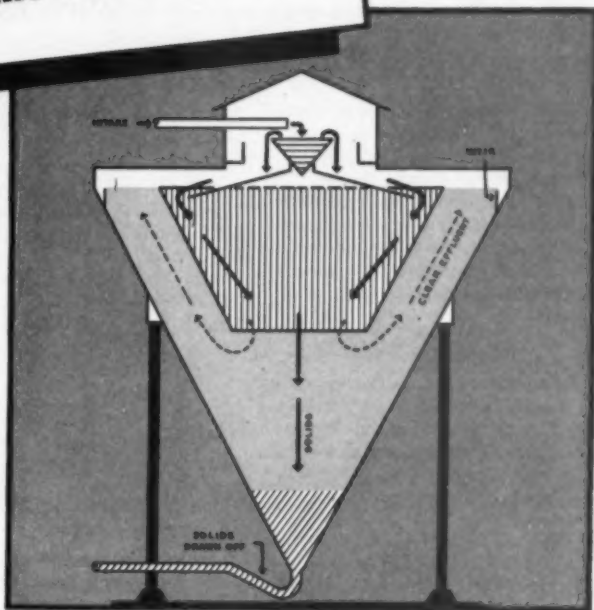
About a year ago, these motors were rewound with Silicone (Class H) Insulation at a cost of about \$150.00 each. Minimum life for Class H motors in this service is 6 months.

Maintenance costs that would have totaled \$10,000 a year have been cut to \$1,200. That's a net saving of more than \$8,000 plus a good 400 man hours of labor and a bonus of some 40,000 parts that would have been lost because of down time.

The MARX SAVEALL for the Recovery of Pulp Fiber from Paperboard Machine White Water

Material shortages create the need for greater utilization of existing stocks. Any needless waste is extravagant and costly. That's why the Marx Saveall has proved itself time and time again in the pulp and paper industry. For here is an efficient, yet economical, way to recover lost profits from waste water.

The Marx Saveall consists primarily of two large steel cones, one mounted inside the other. There is a small receiving well at the top of the unit, with an inverted deaeration cone directly below it. Waste water fed into this well, overflows on to the deaeration plate and runs off its edge. Suspended solids settle through the inside cone and collect in the base of the outside cone. Water, minus most of the solids, rises between the two cones, and flows over a circular weir into a draw off channel. The solids are drawn from the bottom of the outside cone for reuse.



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At the Dallas, Texas, plant of Fleming & Sons, Inc., a Marx Saveall proved 95 per cent efficient in recovering fiber from the white water effluent. Suspended fibrous solids were reduced from 3.5 to 0.17 lbs. per 1000 gallons. And each ton of the recovered fiber meant an \$18.00 saving for this paperboard manufacturer. What had formerly gone into the sewers is now being reclaimed and transferred into new profits.

With a Marx Saveall, water can be used over and over again. The Marx Saveall also provides additional water storage capacity for emergencies.

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Los Angeles 17.....1845 General Petroleum Bldg.
New York 6.....3312—145 Broadway Bldg.
Philadelphia 3.....1646—1700 Walnut St. Bldg.

Salt Lake City 4.....545 West 17th South St.
San Francisco 4.....1531—200 Bush St.
Seattle 1.....1245 Henry Bldg.
Tulsa 2.....1628 Hunt Bldg.
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Industrial Cooling Equipment Maintenance

Plant-tested check-chart maintenance data for industrial cooling equipment — distribution system, gear box, drive shaft, motor, filling, cold water basin, structural members, and precautions for shutting down.

By **HOWARD E. DEGLER**

Technical Director
The Marley Company, Inc.
Kansas City, Kansas

THE life of any piece of water-cooling equipment is directly dependent upon its inherent qualities, type of service, severity of operation, general care and maintenance, and climatic environment. In any event, the continued usefulness of all mechanical equipment is primarily dependent upon maintenance.

Water Treatment

Treatment of cooling tower water includes: prevention of corrosion and scale formation on heat-exchanger equipment; prevention and control of algae; and control of delignification of cooling tower lumber.

The amount of make-up water required depends upon evaporation loss, drift loss, and blow-down. The amount of blow-down water required depends upon the hardness of the circulating water, the type of water softener or inhibitor used, and the amount of drift loss.

Mechanical Maintenance Check Chart

Distribution System—inspect for clogging weekly . . . lubricate, tighten loose bolts and clean as required.

Gear Box—Check for unusual noise or vibration, check shafts for lateral movement, inspect keys and keyway, check oil level and oil for water and dirt, and make certain vents are open weekly . . . lubricate and tighten loose bolts semi-yearly . . . repaint as required.

Drive Shaft—Check for unusual noise or vibration, lubricate and tighten loose bolts weekly . . . repaint as required.

Motor—Check for unusual noise or vibration, feel for overheating, check shafts for lateral movement, inspect keys and keyway, check oil level and oil for water and dirt and make certain vents are open weekly . . . dry out yearly . . . lubricate and repaint as required.

Filling—Inspect for clogging, inspect for deterioration and renew (if necessary) semi-yearly.

Cold Water Basin—Inspect for clogging weekly . . . inspect for deterioration yearly . . . repaint and clean as required.

Structural Members—Check for unusual noise or vibration and inspect for deterioration yearly . . . repaint as required.

Scale

Some scale-forming materials are found in practically all water; however, the most troublesome are normally calcium and magnesium carbonates. Scale formation on equipment reduces heat-transfer rates. This scale can be reduced or prevented by softening the make-up water with lime and soda ash, zeolites, sulfuric acid, soluble phosphates, or sodium chromate. Regardless of the water-treatment method used, a systematic program of blow-down should be established to control the dissolved solids in the cooling water.

Algae

Algae formations may plug nozzles and prevent proper water distribution. This growth may collect on the equipment served, reducing the heat-transfer rate. Hold algae at a minimum or eliminate it. This is done by adding a little chlorine

($\frac{1}{2}$ to 1 ppm), chlorophenol compounds, copper sulfate (1 to 10 ppm), or other chemicals to the circulating water.

Two-Speed Motors

For adapting performance to temporary or seasonal decrease in heat load, and especially for winter operation, two-speed motors are best for fan drives. The chief advantage is that at half speed, fans need only about 15 per cent of their full-speed power. Especially in multi-fan units, the flexibility of two-speed motors saves power.

General Maintenance

To obtain the best operating results, the distribution system and the catch basin under the tower must be kept free of dirt, algae, and scale. Fans driven by variable speed devices must not be operated above the speed for which they were designed. Concrete basins should be provided with double suction screens; that is, one set of screens placed in front of another so that all of the water goes through both.

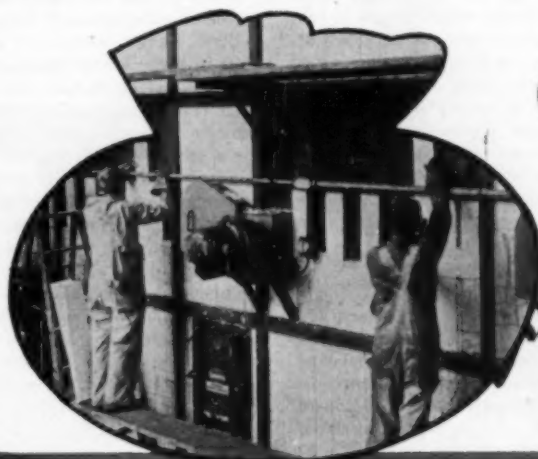
Inspect oil in speed reducer weekly and add oil when necessary to maintain proper level. Drive shafts equipped with splines, gears, or universal joints should be greased weekly. Drive shafts equipped with couplings using rubber-bending members do not require lubrication.

A daily inspection schedule is recommended to determine whether the cooling tower is operating properly.

Reduced cooling range indicates a light heat load or excess water. Increased cooling range indicates heavy load or insufficient water. When a condenser becomes badly

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Why not call on insulation headquarters for engineering advice about your insulation work. J-M Insulation Engineers are available to help select the *right* insulation for your particular service conditions. Write Johns-Manville, Box 290, New York 16, N.Y.



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scaled, water quantity circulated is frequently retarded and pumping head increased. Higher cooling water temperature usually indicate this condition. Thus, if water quantity is incorrect, (1) check pump for speed, pressure, and freedom from air; (2) check condenser for scale, air, or restrictions; and (3) check pipe lines for air, partially closed valves, dirt, or restrictions.

Cold Weather

Extremely cold water normally does not increase performance to any great extent, but operating hazards are increased considerably. To prevent icing during cold weather operation, one or more of the following procedures are recommended for induced-draft towers: (a) shut down fans completely but do not shut off water, this may retard ice formation; (b) cover upper portion of louvered area; and (c) shut off some of the cells.

If ice should form on the louvers and filling, one of the following methods of removal could be used: (a) reversing (for a limited time) the rotation of the motor driving the fan and thus blowing the warm air backwards and out through the louvers; (b) shut down some fans temporarily but do not shut off waters; (c) cover upper portion of louvered area.

Mechanical Maintenance

A regular schedule should be set up for the mechanical maintenance of cooling equipment. Well main-

tained equipment gives the best operating results and the least overall maintenance cost. Ball-bearing motors should be greased with an approved water-resistant grease every one to three months. Follow instructions issued by the motor manufacturer when greasing motors. Do not over-grease ball bearings, for over-greasing will cause their failure almost as quickly as under-greasing. Insulation value of the motor should be checked yearly.

Drain out the old oil and refill speed reducers with clean oil of the proper grade every 3000 hours of operation, or at least twice a year. The proper grade of oil for speed reducers is usually shown on the name plate. Excessive clearance or play between pinion and ring gears indicates wear. Oil leaking around the pinion shaft or fan shaft indicates that the oil seals are worn and should be replaced.

Structural Maintenance

Remove all dirt, scale, bugs and debris from the distribution system. Replace all damaged or missing parts. Clean and paint all corrodible metals as required. Redwood does not require protection from the weather, but in some cases it may be desirable to paint it for appearance. Tighten all loose bolts, making allowance for the swelling of wood when wet.

Drift eliminators should be cleaned when appreciably dirty. Dirty eliminators reduce air flow through the cooling tower. Elim-

inator spacers should be aligned. When installing eliminators do not leave holes between eliminator bundles, or between ends of bundles and adjacent members, as these spaces would allow excessive drift. When wood filling slats become dirty they should be cleaned. Replace broken or badly warped slats, maintaining the same "pattern" or spacing of slats both vertically and horizontally as in the original installation.

Shutting Down

When cooling equipment is shut down for an appreciable time, particularly in cold weather, it should be drained to prevent damage from freezing and corrosion. Leave the drain open to allow rain and melted snow to escape. Operate the fans for a period of approximately five minutes once a week to keep the upper fan shaft bearing oiled. Protect metal parts from corrosion.

Maintenance or repair work should be done while the cooling equipment is completely shut down, if possible. This gives the best opportunity for inspection and maintenance and does not restrict the operation of any of the equipment served. A properly maintained and efficient water-cooling unit is one of the most important factors in a modern plant requiring cooling water and will greatly improve the overall efficiency of the process involved.

This maintenance data has been adapted from a recent address by Mr. Degler before the Amarillo, Texas, Regional Meeting of the Natural Gasoline Association of America.

Double Layer Insulation

APPPLICATION of molded insulation in two layers instead of a single layer of equivalent thickness results in a more efficient and, where a fire hazard is present, a safer installation, according to The Magnesia Insulation Manufacturers Association.

Expansion and contraction of high temperature equipment often causes joints between insulation blocks or sections to open. Enough heat can escape through these cracks to materially reduce the ef-

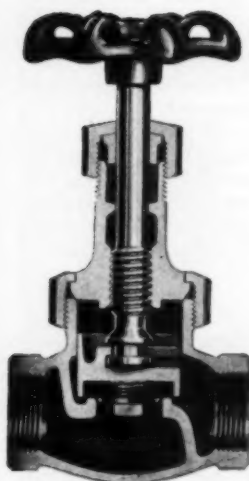
fectiveness of the installation. Furthermore, the canvas or cement finish around the joint area may become sufficiently scorched to require repair or replacement.

Open joints are particularly dangerous in a fire hazard area, such as a refinery where a leak or break in an adjacent pipeline or vessel would allow escape of a flammable liquid. In a Southwestern refinery enough heat escaped from the open joints of the insulation on a pipeline to ignite some oil-soaked ma-

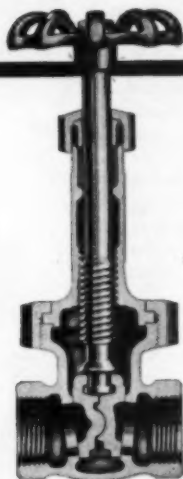
terials left temporarily on the line. Canvas jacket of a high pressure steam line in a large central station power plant on the east coast was ignited by the heat escaping from the open insulation joints.

Double layer insulation permits the use of staggered joints and prevents these troubles. After the first layer is wired on, the sections or blocks in the second layer are applied so that each joint is centered over a block or section underneath. If the joints in the inner layer should open, the outer layer acts as an effective heat seal. In this way, there is no path of heat escape from the equipment surface to the outside.

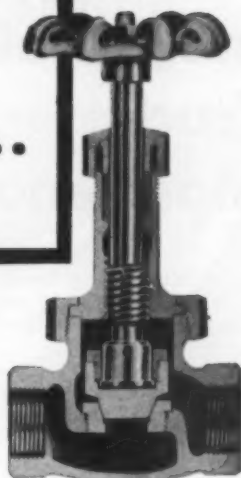
Walworth bronze valves...



Walworth No. 95 Globe Valve
Re-New-Disc



Walworth
No. 29 Gate Valve



Walworth No. 225P Globe Valve
500 Brinell Seat and Disc

**built to give
dependable trouble-free service
on all recommended jobs**

Walworth No. 95 Bronze Globe Valves (Angle Type: No. 96) are recommended for service where throttling is not required. They are rated at 150 psi working steam pressure, 500F; 300 psi cold water, oil or gas. The improved renewable disc and lock-on, slip-off disc holder — an original Walworth development — saves time and trouble. This valve can be repacked under pressure when fully opened. All parts are designed to give maximum service and strength.

Walworth No. 29 Bronze Gate Valves are rated at 200 psi working steam pressure, 550F; 400 psi cold water, oil and gas. These valves have rising stems and integral seats. Sizes 2-inch and smaller have union bonnets; sizes 2½ and 3-inch have bolted bon-

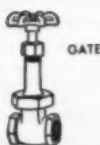
nets. Valves up to and including ¾-inch have solid wedge discs; 1-inch and larger have split wedge discs. These valves can be repacked under pressure when fully opened.

Walworth No. 225P Bronze Globe Valves (Angle Type: No. 227P) are rated at 350 psi working steam pressure, 550F; and 1000 psi non-shock service on cold water, oil and gas. The stainless steel, plug type seat and disc — heat treated to 500 Brinell — can be closed on sand, slag, scale and similar floatage, without injury to the seating surfaces. They are the longest wearing, **TOUGHEST** bronze valves you can buy.

For full information about Walworth Quality Bronze Valves, see your Walworth distributor, or write:



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CHECK

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Industrial Truck Maintenance

FOURTEEN ways to lower operating costs of electric industrial trucks are outlined by Charles Greener, general service manager of the Automatic Transportation Company.

Planned preventive maintenance assures reduced service budgets, longer truck life, and less "down" time while trucks undergo repairs. The program for both one-truck and fleet operations, based on studies of successful techniques, includes these recommendations:

1. Loads should suit the truck. Teach your operators that truck capacity varies with load length, and that continual overloading causes serious breakdowns and plays havoc with tire bills. Use trucks with ample reserve capacity.

2. Keep floors clean and in good condition. Bad surfaces cause damaging strains and shocks, and again your tires suffer unnecessarily.

3. Replace tires when they develop flat spots or when big chunks of rubber are gouged out. Stretching tire use damages the truck, costs you far more in repairs than you think you are saving, and is bad for driver health and efficiency.

4. Let the right man—the mechanic—do repair work. When something goes wrong, have your operator call the mechanic, and don't let him have the truck pushed or towed without the mechanic's orders.

5. Your operators should be trained thoroughly in proper use of equipment assigned to them. Whenever possible each man should work regularly with the same truck.

6. When you get a new truck, be sure to obtain full information about it. Have the manufacturer's service representative demonstrate it for your operators. He should advise your maintenance force, explain spare parts needs, and make

sure no damage was incurred in shipment.

7. Your mechanical maintenance program, whether large or small, should follow a regular schedule. Use a series of mechanical worksheets or tags prescribing services to be performed. Keep a fleet maintenance record to learn the life expectancy of important units of the truck. This enables you to make necessary changes in advance to avoid complete breakdown, preventing loss of operating time.

8. Trucks need a monthly lubrication and mechanical check, usually requiring about an hour and a half, which should follow removal of dirt and grit from the undercarriage. Fleet operation calls for a cleaning rack in a small room or enclosed area. A weak alkaline solution applied under steam pressure does a good cleaning job, and compressed air is best for drying. After the mechanical check, lubricate the truck. Make a large blow-up of the manufacturer's lubrication chart so your maintenance men can follow it easily.

9. Semi-annual mechanical checks and lubrication are more extensive. Included are cleaning and repacking wheel bearings, changing drive axle grease or oil, and any other services not assigned to the short-term checkups.

10. Electrical checks should be conducted on a weekly, monthly, and semi-annual basis. The weekly check includes tightening loose fittings and replacing worn or damaged ones. Monthly, all electrical operations should be observed closely, and semi-annually, the complete electrical inspection will save you money. Tightness of electrical connections and proper insulation of wires should be noted carefully.

11. Be careful with your batteries. Overwatering will weaken the electrolyte, and when it spills over from the battery case, the electrolyte causes corrosion of other truck parts. Flushing the battery is a necessity, as the battery must be kept clean. Make this part of the weekly inspection. Use properly maintained automatic charging equipment.

12. General overhauls should be scheduled according to your operating conditions, such as the number of hours the truck works daily, plant conditions, and the driver's ability.

13. Keep a weekly log for each truck, on which you record inspections, lubrications, and cleanings. This permanent record will help you make sure necessary preventive maintenance functions are performed.

14. The program outlined above is based on one shift a day, and favorable operating conditions. Under rough conditions, such as bad floors, more than average dirt, or more than one shift a day duty, trucks require more frequent use of some or all of these checks. It is wise to consult with the manufacturer's service representative in regard to this.

Mr. Greener recommends that truck users treat preventive maintenance as a money-saving part of their operation. Properly conducted, it will permit finding out which operators are not doing their jobs well, which trucks are assigned to jobs for which they are not fitted, and what changes can be made in truck design to improve their utility.

For all high pressure testing

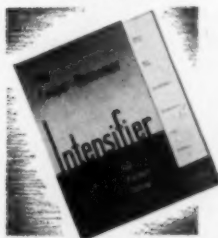
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The Intensifier is available in two sizes—Model 10 for testing with water up to 10,000 psi and Model 23 for testing with oil up to 23,000 psi. For complete information send to any Cooper-Bessemer office for a new bulletin.

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Emergency Radiography for Stress Relieving in the Field

By HARRY M. SPRING

SOME time ago the lower side wall header of a large watertube boiler developed a bulge. The bulge split at its apex and major repairs became necessary in a hurry.

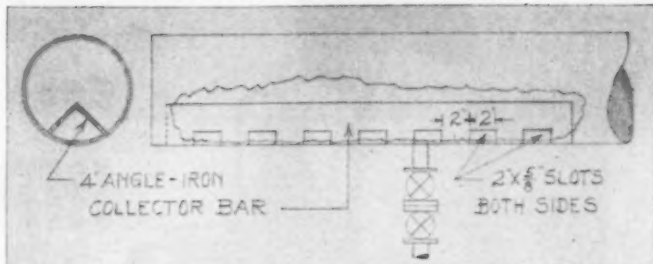
The overheating was due to a combination of two things. First, sludge drifted past the blowdown line and accumulated in a pile. This condition was corrected after repairs by use of an angle iron collector bar (see illustration).

The second factor which is somewhat controversial is whether there is a limit in thickness for a header exposed directly to the radiant heat in the fire line of a chain grate stoker. It would appear to the writer that there should be a limit not so much because of bulging as because of high service temperatures and development of defects if the thickness is excessive.

Repairs to the bulged header first consisted of cutting out the defective area. A flush welded patch of the same material and thickness as that in the header was installed. The illustration shows that patch with temporarily attached strong backs as it is being welded into the header.



This bulge split and repairs were necessary.



Angle iron collector bar corrected trouble.

Following a strength weld such as this, it was decided that the repair must match the weld required with new construction.

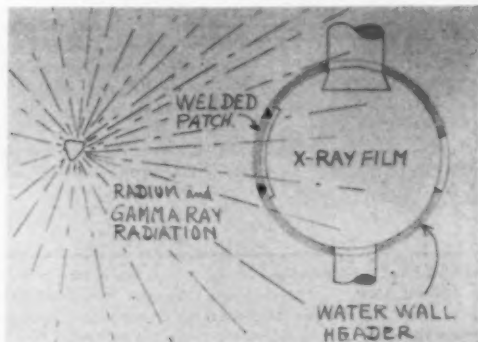
The welded joint in the patch was stress relieved at 1100 F for one hour per inch of thickness. Multiple torches were used for the heating and an asbestos blanket was used to induce slow cooling.

Following the stress relieving,

the entire joint was radiographed by use of a capsule of radium and the gamma ray process. It should be noted that any exposure of radium should be only in the presence of those experienced in its use as it can be dangerous to personnel health. The welded joints showed no defects in the radiograph and the boiler was safely returned to service.

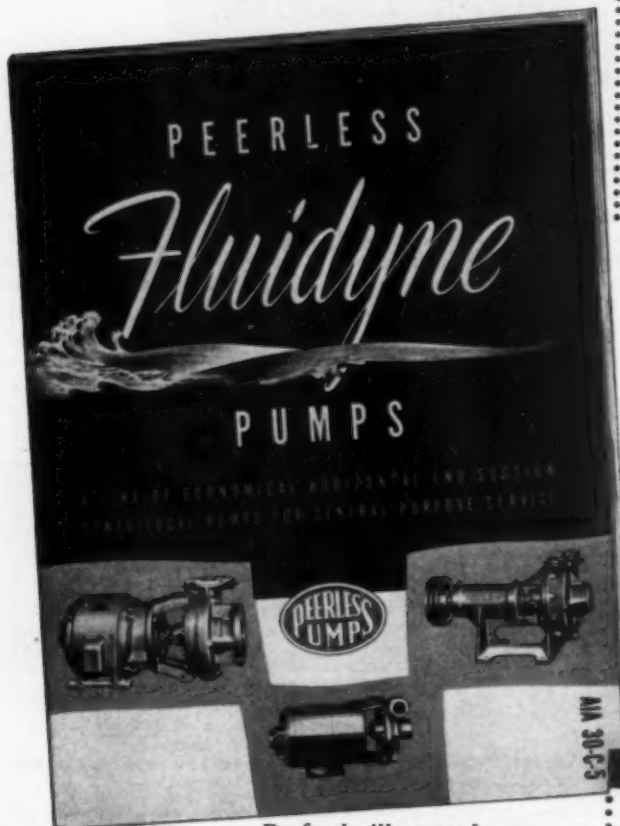
A flush welded patch was installed.

The entire joint was radiographed.



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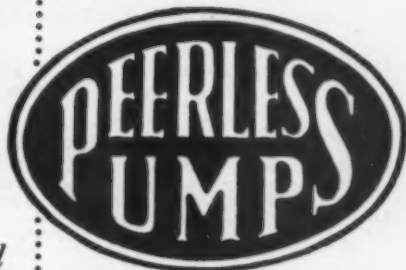
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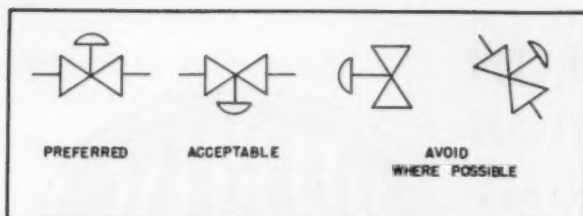
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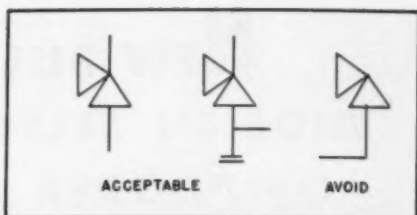
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SP1



LEFT: Wherever possible, install diaphragm operated valves used in controlling pressure, temperature and level so that the stems are vertical with the diaphragm uppermost. If not practical, install with diaphragm below, taking precautions to prevent accumulation of water and dirt on the diaphragm if it is exposed on the outermost side. It is unwise to install such valves with stem horizontal as very frequently the weight of the diaphragm assembly causes a distortion of the stem with



resulting binding. Some valves are so constructed that the diaphragm follower plate can drop out of its proper position and make the valve inoperative.

RIGHT: Angle type control valves handling hot condensate under pressure should be installed with a straight run of pipe on the outlet of at least twelve pipe diameters in length to prevent rapid erosion and failure of the line.

Regulator and Controller Troubles

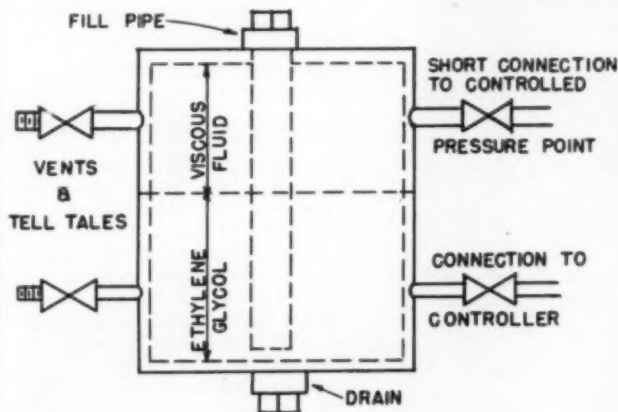
By J. M. TOTTEN

RECOMMENDED installational procedures for diaphragm operated valves used in controlling pressure, temperature and level are illustrated. Special consideration should be given in the installation of the control valve to the space needed

to dismantle the valve for maintenance without removing it from the line. Prior to the initial operation, it is recommended that temporary strainers be installed upstream from the control valves to prevent welding slag and other

foreign matter from getting into the valves and damaging them.

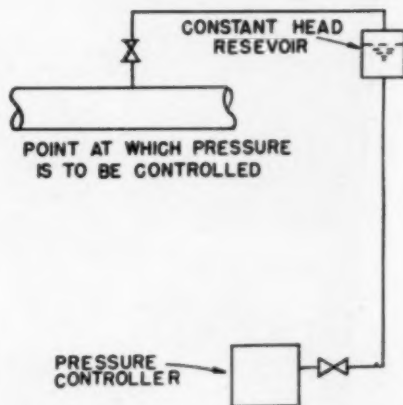
Liquid level controllers which are used to control the level in vessels which are under a vacuum, and which are equipped with a constant head pot on the upper connection to the vessel, will not operate satisfactorily unless a very small amount of liquid is fed into the constant



LEFT: Diaphragm valves which are actuated by the fluid which flows through the valve and which handle viscous materials can be made to operate more smoothly and dependably if the pilot line is filled with a less viscous fluid. In the case of valves handling heavy fuel oil this is accomplished by installing a small reservoir at the pilot line connection on the main line, which reservoir is half filled with ethylene glycol. The fuel oil is connected to the top of the pot and the pilot line is connected to the bottom of the pot and to the diaphragm. Ethylene glycol also has a low freezing temperature which is a distinct advantage where the pilot line is out-of-doors and exposed to temperatures at which water would freeze or oil would solidify. The corrosive characteristics of the fluid should be kept in mind in selecting materials for the pilot line. Stainless steel tubing, although expensive, has proven very satisfactory for many ap-

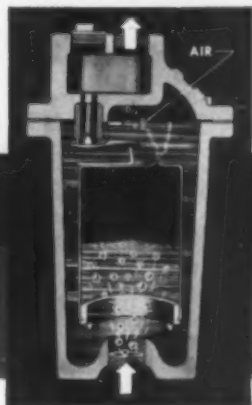
plications. Hard drawn copper tubing is satisfactory for water, air and non-corrosive gas.

RIGHT: There are many applications where diaphragm operated valves are used to control the pressure at, or very close to, atmospheric pressures. It is advisable to impose on the controller a positive head so that it will be subjected to, say, a pressure of at least 5 psig when the control pressure is at or near 0 psig. In this manner the sensitivity, or speed of response, of the controller is improved at little expense. This can best be done by installing a constant head reservoir at the proper elevation above the controller, the control pressure being brought in the top of the pot above the water level, and the line to the controller being connected to the bottom of the pot below the water level.



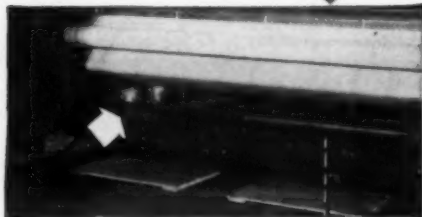
Armstrong traps vent air to give you hotter machines

HIGHER TEMPERATURES
MEAN MORE OUTPUT



PSIG	Temp. of Steam with No Air Present	Temperature of Steam Mixed with Various Amounts of Air. (Per Cent Air by Volume)		
		10%	20%	30%
10.3	240.1	234.3	238.0	220.9
25.3	267.3	261.0	254.1	246.4
50.3	298.0	291.0	283.5	275.1
75.3	320.3	312.9	304.8	295.9
100.3	338.1	330.3	321.8	312.4

THIS TABLE TELLS THE STORY. You can't get the maximum temperature you need unless you get the air out.



PYROMETER TESTS SHOWS 30° TEMPERATURE INCREASE on flatwork ironer rolls at Peter Bent Brigham Hospital, Boston, after installation of Armstrong traps which vent air along with condensate.

EVERY time an Armstrong steam trap opens there is a momentary pressure drop which "pumps" air down to the trap from the unit being drained. The air passes through the bucket vent and accumulates at the top of the trap to be discharged along with condensate each time the valve opens.

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ARMSTRONG STEAM TRAPS

head pot to make up for the loss in level in the pot, which results from in-leakage of minute quantities of air.

Many pressure control valves and flow control valves are fundamentally globe valves and when handling an incompressible fluid the flow should be upward through the

seat. If valves are handling a compressible fluid such as gas or air, the direction of flow is of lesser importance. However, in a number of cases it has been found that the operation of the valve is less noisy if the flow is downward through the seat.

Very severe cases of water ham-

mer have been experienced with the installations where the flow was down through the seat. As the valve disk approaches the seat the force of the flowing water on the valve disk tends to slam the valve shut with the result that a steep and powerful velocity wave is generated in the piping.

Help Your Rope Give Longer Service

By STEPHEN REED

Field Engineer
Plymouth Cordage Company

THE following brief suggestions are presented to help the user get longer, safer, more economical service from hard fiber rope. The author will give more details in a longer article on this subject in the June issue of SPI.

1. The first essential is to buy good rope.

2. Don't overload your rope, it is both dangerous and costly.

3. Avoid unnecessary surface wear and abrasion.

4. Avoid sharp angles or bends.

5. Maintain the twists in the some direction as when the rope came from the factory.

6. Equalize the wear throughout the length of the rope. Frequent reversals help.

7. Relieve tension when rope is subjected to wetting while held between two points. Avoid stretch.

8. Keep rope clean, and protect it from all chemicals.

9. Dry rope before storing in a closed space.

10. Don't after treat your rope. The manufacturer can supply especially treated rope when needed.

11. When removing new rope from a coil—be sure that right-handed rope comes from the coil in a counter clockwise direction.

12. Join rope by splicing rather than tying. Knots reduce strength about 50%.

13. Lashings are often drawn tight by hauling one line across another at right angles—in which the loss of strength is more than 50%.

14. Where similar objects are to be continually handled—use properly made slings. The loop type sling, or a rope spliced endless, is most economical.

15. Increasing the number of parts of a sling does not increase strength proportionately. The angle of the sling is also important. A 120 degree angle will strain the rope almost twice as much as a 60 degree angle.

16. Examine slings frequently for damage.

17. Theoretically, the mechani-

cal advantage of tackle is indicated by the number of parts to the moving block—but 10% friction factor should be added to the load for each sheave in the assembly.

18. Use a factor of safety of at least five—more for old rope and adverse conditions.

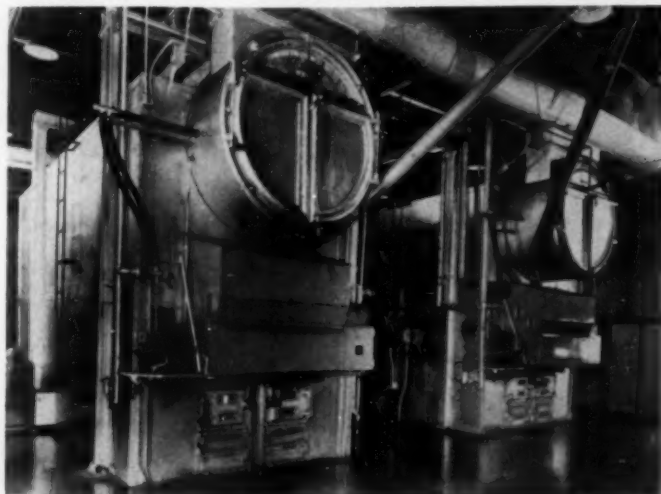
19. The safe working load for blocks should always be checked. The safe load of the rope is usually greater than that of the block.

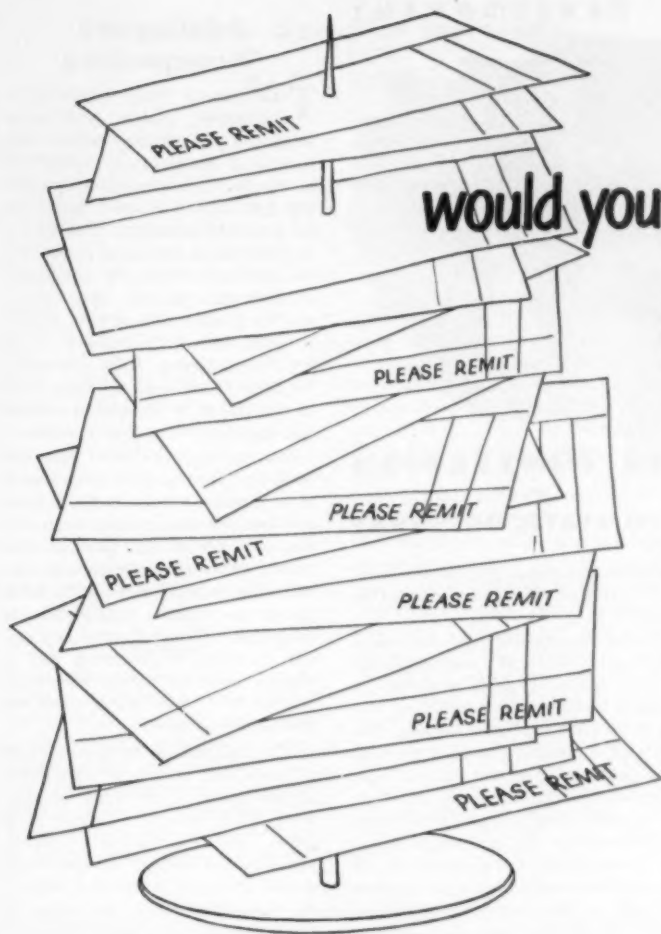
20. Reeving tackle is an important job and must be done properly—when in doubt, secure and follow reputable manufacturer's diagrams.

The preceding suggestions will be expanded, discussed and illustrated in a feature article by the same author which will follow in the June issue of SPI.

Boiler Room Maintenance

View in boiler room at Chadbourn Hosiery Mills, Charlotte, N. C., showing cleanliness of operation with the (American Coal Burner Co.) stoker installations. The performance record of this installation is excellent, it is believed that cleanliness contributes appreciably to its low maintenance.





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Of course you wouldn't — but maybe you do.

Let's consider a few figures. At a conservative estimate, a good boiler will give you 200,000 hours of service. If it is a 100,000 lb/hr boiler it will burn during that time not less than \$8,000,000 worth of fuel—even at today's prices.

If, through failure of your control system to give maximum combustion efficiency, you waste as little as one per cent of that fuel, your control system will have cost you \$80,000—in addition to what you paid for it originally.

You will still have the same control equipment but you will have paid for it sixteen times over!

With a system by Hagan, you pay for your control just once.

Hagan Automatic Combustion Control is designed for precise control. When it is placed in service, it is adjusted

by Hagan's experienced combustion engineers, who make sure that you get the precision which is built into the control system.

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Hagan controls are used on every size of boiler from 5,000 pounds per hour at 3 psi to 1,340,000 pounds per hour at 1800 psi. They have been applied to boilers burning oil, coal, gases of various types, sawdust—and always with satisfactory results.

Our engineers will be glad to give you full information concerning Hagan control systems. Write to Hagan Corporation, Hagan Building, Pittsburgh 30, Pa.



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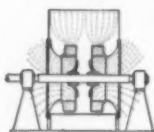
ANOTHER

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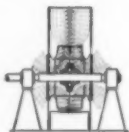
DEVELOPMENT



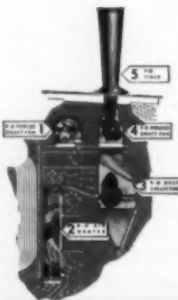
Gives you **GREATER CONVERSION OF VELOCITY PRESSURE TO STATIC PRESSURE**



How F-D split wheel assists diffusion— aids distribution throughout the fan.



Conventional double wheel with common disc produces concentration, results in poor diffusion.



Performance ratings of the Prat-Daniel F-D Fan are established according to the Standard Test Codes adopted by N.A.F.M. and the A.S.H.V.E.

Design characteristics provide unusually high conversion of Velocity Pressure to Static Pressure. This is accomplished by streamlined inlet cones that are larger in proportion to the wheel than are usually found in forced draft fans. The unusual depth of the cones provide a wider housing than would customarily be used, increasing the space available for diffusion. Precisely fashioned backward curved blades provide a nearly perfect aerodynamic flow across both leading and trailing edges. Double wheel fans are spaced apart to permit four way diffusion of air, further contributing to this conversion. Peak efficiency and horsepower curves fall well within normal fan selection range, offering the optimum in maximum efficiency and non-overloading characteristics.

These are all carefully researched features that have made the Prat-Daniel F-D Fan a highly efficient apparatus. Check these features before you decide on your next fan. Write for catalog No. 300 today.

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The Thermix Corp., project engineers for the Prat-Daniel Corp., offer all components required for the handling of air and gas: (1) P-D Forced Draft Fans; (2) P-D Air Pre-Heaters; (3) P-D Tubular Dust Collectors; (4) P-D Induced Draft Fans; and (5) P-D Fan Stacks. This unit responsibility, by a well known firm, relieves the engineer of the necessity of integrating equipment from various sources into the over-all project.

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Painting and Waterproofing

THE use of color dynamics in industrial plants has gone from the experimental stage into a reality. Many of the industrial plants in this area now consider the application of color dynamics as standard practice. The choice of colors is a matter of taste, but the textile industry in particular is leaning toward the pastel shades of blue and green. Where ceilings are to be painted white for the purpose of reflecting light, we have found that the light blue is preferable in life and in reflecting qualities to ordinary white.

The make of the paint does not matter so long as it is the product of a reputable manufacturer who has had the opportunity to survey the location to be painted and makes his own recommendations as to the type of paint to be used under the various conditions encountered. Where fungus is present is must be removed and a poison such as Mertz ZT used, which will not allow further growth of fungus.

We consider it extremely wise to keep any cracks or expansion joints calked at all times to keep moisture from entering through a wall, and particularly where cracks occur in parapet walls that might let water enter the section of insulation that is normally applied to all our roofs. If a roof is insulated with material such as cork, and water is allowed to enter this material, it will, of course, lose its insulating quality and deteriorate rapidly.

Many times plaster is ruined on the interior of a brick building because the wall leaks under the force of a driving rain. In these cases it is well to treat the entire exterior of the area with a transparent sealer that will close up all of the openings, however small they may be. Usually the looks of the structure are not impaired due to the transparent nature of the sealer. This sealer will also go a long way toward completely eliminating any sluffing of the mortar joints or the brick work due to freezing action.—G. F. BENN, NORTH CAROLINA.

Pulverizer Operation Improved

By L. L. PITTS

GEORGIA Power Company's Plant Atkinson is equipped to burn both gas and pulverized coal. The contract with the gas company is interruptable—that is, the gas supply may be reduced or cut off on relatively short notice.

During the period from September until May the amount of gas available varies from enough to carry full load on gas fuel down to no gas. The amount of gas available not only varies from day to day but from hour to hour during changing weather periods. This means that the pulverized coal equipment must always be available to supply pulverized coal to replace gas. This change from one fuel to another must be done quickly without any change in the plant output.

Problem

Considerable difficulty was encountered in getting the pulverizers to start quickly and grind properly. This condition became worse as the grinding rolls and bowl rings became worn. Frequent mill outages were necessary to readjust the grinding rolls to keep the distance between the rolls and

rings as close as possible. It was also necessary to replace the grinding rolls and bowl rings before maximum wear had taken place.

Equipment Modified

The main elements of the pulverizer are shown diagrammatically in the accompanying sketch. The bowl (A) is rotated by power through its vertical shaft. But the spring loaded rolls (B) are factory set so they do not quite contact the bowl. Therefore rotation of the rolls on their shafts is dependent upon contact with the coal as the bowl rotates. Obviously, inertia of the rolls would prove troublesome in quick starting. So a principal object of the design change was to provide initial contact between bowl and rolls to start the rolls turning quickly. Details of the change are not completely shown in the rough sketch, but to those familiar with such equipment, the following description should be clear.

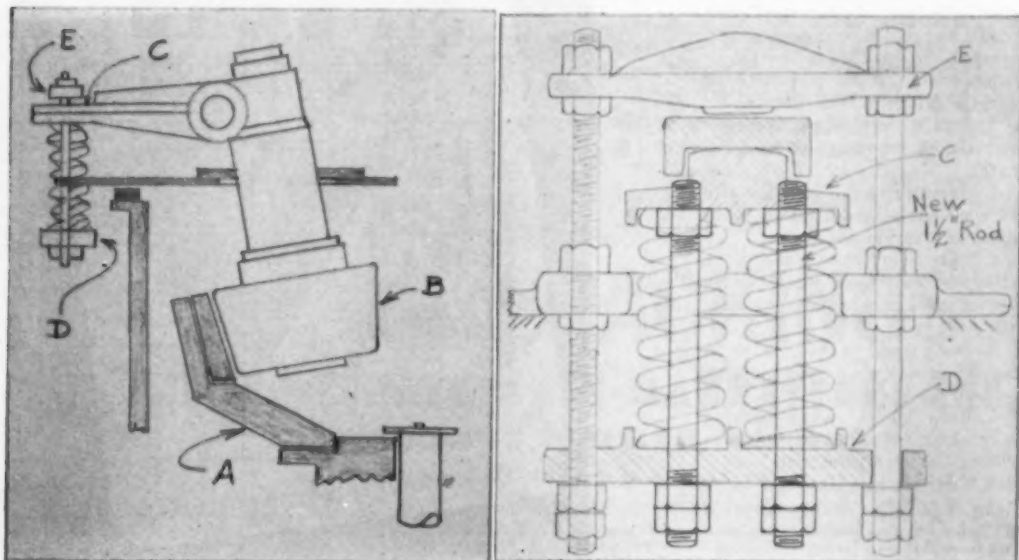
The cross bar (C) was drilled in the centers of its spring seats and tapped for $1\frac{1}{2}$ " rod. The lower spring seats (D) were also drilled

to allow these $1\frac{1}{2}$ " rods to extend down through them. The $1\frac{1}{2}$ " rods were screwed into the cross bar (C), locked with a jam nut and then the nut and bolt were spot welded to the cross bar. An adjusting nut was screwed up on the rod against the lower spring seat so that there was a clearance of $\frac{1}{4}$ " between the grinding roll and the bowl ring. The adjusting nut was then locked with a jam nut.

The stop bar (E) was raised, by moving the stop bar adjusting nuts, until the grinding rolls rested against the bowl ring with only its weight holding it in this position.

The purpose of this change was to let the grinding rolls rest against the bowl ring without any spring tension holding them down. This gives physical contact between the rolls and ring to provide positive turning of the grinding rolls as soon as the bowl ring begins to turn. Formerly the action of the coal between the grinding rolls and the bowl ring was depended upon to start the rolls turning.

This arrangement has proven very satisfactory. The pulverizers can now be started from a cold condition and coal fed to them immediately, whereas before the change was made it was necessary to heat the mills and then quite



often it would take from 45 minutes to an hour to get a mill to grind coal properly. This change has materially reduced the main-

tenance required to keep the grinding rolls adjusted and also allows more wear of the grinding rolls and bowl rings before they are dis-

carded. Starting and stopping is now somewhat noisier than formerly, but the noise continues only for a very short period.

Rebuilt Bearings

THE outboard bearing of a new ice machine had a one inch wide slot in the center entirely around the shaft. A chain oiler worked in the slot, and the chain brought up plenty of oil but it went right back to the oil reservoir and the bearing ran very hot from the start, actually smoked at times. All kinds of oil were tried but nothing would make it run at a reasonable temperature.

This continued for two years,

and then I decided to babbitt the bottom half of the bearing (which was cast integral with pedestal) and use a ring oiler. I made a ring the right diameter to hang on the shaft and reach almost to the bottom of the oil reservoir. Then I drilled holes in the casting on both sides of the slot to hold the babbitt in place. I turned a wood block the exact size of the shaft and then put the ring in the slot and packed clay up to the point

where I wanted the bottom of the babbitt. After clamping the wood block in place, I poured the babbitt. No more trouble was experienced from heating.

While working on the bearing, I cast an oil-slinger ring of babbitt around shaft in the recess at the end of bearing. I also made an oil shield of $\frac{1}{8}$ " plate and placed it on the end of the bearing housing—circling the shaft—to deflect oil back to the bearing. This was in 1940, and the windings of this motor are as free of oil as the day the motor left the factory.—M. S. JONES, MARYLAND.

Safe Use of Slings

A POCKET size card offered by Macwhyte Co., Kenosha., Wis., gives tips on proper care and use of slings for safe handling.

Safety directors and engineers voiced their approval at the recent National Safety Congress. Macwhyte Co., manufacturers of wire rope and braided wire rope slings, created the card as a service to safety men for the promotion of greater safety in their plants.

The following points are enumerated on the reverse side of the card:

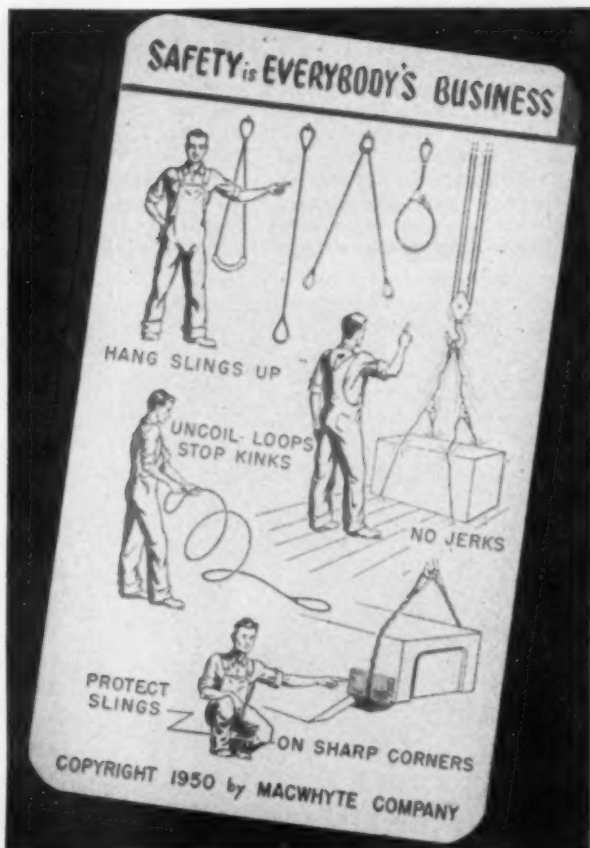
1. A cutting edge cuts the life of your sling—use blocking, padding, or a corner saddle.


2. Take out the kinks—your sling is like your job, it does better work when the kinks are removed.

3. Don't send a boy to do a man's job—use a sling large enough for the load.

4. Keep jerks away—jerking may double the stress in your sling. Lift load gradually.

5. Your sling is like your hat—hang it up after each use and it will be clean, undamaged, and ready for the next job.





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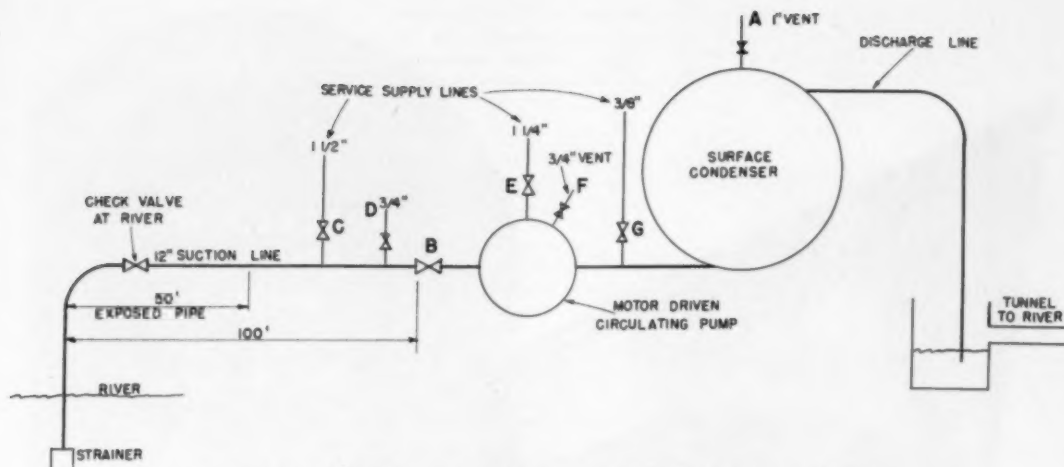
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Method of priming suction line of centrifugal pump from water in surface condenser.

Priming Centrifugal Pumps

OUR stand-by turbine has an 100 ft. 12-in. suction line running from the pump to the river. Nearly 50 ft of this line is exposed and subject to occasional freezing conditions. During these periods of cold weather, we allow the suction line to drain through a 12-in. check valve, which does not seat tightly.

Operational Problem

During freezing weather, considerable time was lost in filling the 12-in. suction line from the service supply line. To solve the problem we modified the system

as illustrated. We now keep the condenser valve B closed at all times when the unit is not in operation. Valve G on the $\frac{3}{4}$ -in. line, which keeps the condenser full of water, is left open.

Operational procedure to start the stand-by turbine is as follows:

Open valve A on vent line of discharge line.

Open valve B to allow water to pass from condenser into suction line.

Open $1\frac{1}{4}$ -in. line valve E from service supply.

Open $1\frac{1}{2}$ -in. valve C from service line into 12-in. suction line.

Open $\frac{3}{4}$ -in. vent D in suction line and $\frac{3}{4}$ -in. vent F on top of centrifugal pump. Air will then blow out these two vents. When water appears, close valves A, F and D. Centrifugal pump is then started.

When water appears in large quantities in the discharge tunnel well, close valves C, E and G. Turbine is now ready to start.

To shut down the centrifugal pump, valve B is closed and A opened to break syphon effect of discharge lines. Valve G is then opened and left open to keep condenser filled with water. If threatened by freezing conditions, valve D is left open, allowing the water left in the 12-in. line to drain through the check valve at the river.—GEORGE C. AVANT, WILMINGTON, NORTH CAROLINA.

Zinc Painting for Rusty Roofing

AN effective way to add years of life to badly weathered galvanized roofing or siding is to apply metallic zinc paint, which not only stops rust but restores the protection supplied by the original zinc coating so effectively that it has been aptly called "liquid galvanizing."

No Wire Brushing

Hitherto, wire brushing of rusty

galvanized roofing has been considered necessary to prepare a perfect surface for the application of zinc paint. Now wire brushing appears to be economically unsound and unnecessary, according to actual field tests recently concluded by the American Zinc Institute.

Perfect preparation of the surface, which is compulsory in most painting operations, would re-

quire wire brushing, but years of MZP testing in normal roof exposure proves that the results are only slightly better, if any, than those obtained with an ordinary stiff-bristled fiber broom. Certainly it appears that wire brushing fails to increase service life enough to justify the added expense in time and labor.

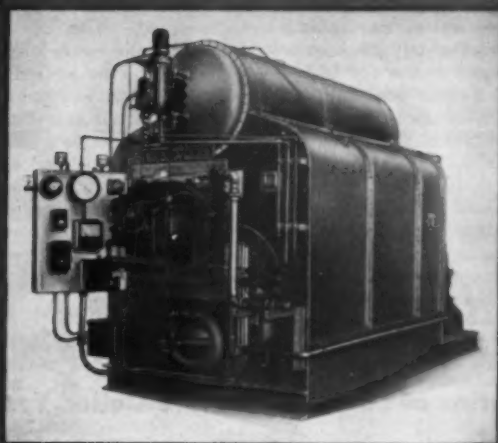
Case History

The southern exposure of an extremely rusty roof was divided into two sections. One was steel-brushed, the other brushed with a

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The Erie City Keystone Steam Generator combines a low headroom, 2-drum water tube boiler; insulated steel casing; automatic burner for either oil or gas or both, interchangeably; control panel with all instruments and safety controls wired and piped at the factory; induced draft equipment—all mounted on a common base and shipped as complete units in sizes to 800 h.p.



180 h.p. Erie City Keystone Steam Generator with Combination Oil or Gas Burner.

Compact Design—The Keystone packs large steam capacity in small cubage, because of its unique furnace, contained within a low-head 2-drum water tube boiler.

Conservatively Rated—The Keystone offers unusually large heating surface per developed horsepower. Ratings are based on 5 square feet per developed horsepower—accepted practice in water tube boiler design.

Fast Steamer—The Keystone is highly responsive to changing load demands, for hot gases travel 3 lengths of the furnace, contacting 5 bare metal heat absorbing zones. Big boiler performance in small space.

Centralized Control—All specified instruments and controls, factory assembled, and mounted on a central instrument panel. All electrical connections to terminal blocks eliminate inter-connecting field wiring.

Automatic Burner—The Keystone is equipped with fully automatic burner for gas, oil or for both interchangeably.

Insulated Steel Casing accurately fitted to reduce radiation losses and air infiltration—removable panel type—all tubes accessible.

Combustion Control—interlocked electrical controls, steam pressure actuated for smooth adjustment of fuel, primary and secondary air supply to obtain most efficient high and low flame position.

Induced Draft equipment is of low speed, conoidal type with automatic damper control on panel.

Safety Controls include automatic cut-offs for high pressure, low water, flame failure, induced draft failure and fire switch.

Easy to install—easy to maintain—Keystone requires no special foundation or stack—just set in place and hook up service connections. Wind box is hinged for easy furnace inspection, hinged burner swings out for inspection—removable side panels give access to any tubes—manholes provide access to drums and tubes.

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broom, and both were given two sprayed coats of MZP. Seven years later, the difference in the condition of the two sections was almost indiscernible.

Application

Metallic zinc paint, as made by more than 150 manufacturers in this country, is a mixture of 80 per cent. zinc dust and 20 per cent. zinc oxide in linseed or soybean oil. It is battleship gray in color (unless colors are added), weighs approximately 23 pounds per gallon and covers 600 to 800 sq ft per gallon, depending on the condition of the surface. Federal Specification TT-P-641 permits substitution of limited amounts (up to 10 per cent) of coloring materials for an equivalent percentage of zinc oxide. Thus various shades of red, green, buff, etc., may be obtained.

It is theoretically best to paint roofs or sidings of zinc-coated corrugated steel before actual rusting begins—when dark areas are first observed here and there over the surface. With ordinary roofing, this appearance will develop usually after 10 to 12 years' service. However, Institute engineers generally recommend painting when 10 per cent of the surface has weathered sufficiently to show rust. If only spots of rust have developed, give them a coat first, then paint the entire surface.

The best time to paint is in warm, dry weather when the paint will spread well and dry readily. Paint should not be applied when rain is threatened, or when the surface is damp with dew.

Hand brush application is the simpler and quicker method for small jobs. Paint may be brushed out, but the thicker the film (so

long as the paint does not run), the longer the life of the zinc coating whose function is to protect the steel sheet.

Where areas of several hundred square feet are to be painted, spray painting is preferable, though. The amount of paint required will be about 25 per cent more than application by brushing—some 450 to 600 sq ft per gallon sprayed. Pressures of 75 to 80 psi should be used on the paint line, because the paint is being elevated to roof height. Then, for proper atomization, 100 to 120 psi should be applied to the air line. For best results, an external-mix gun should be used—the type which brings the paint out through a center orifice, and applies air under pressure around it. Trigger the gun at the end of each stroke to avoid piling up the paint in uneven laps.

Insulation of Low Temperature Coiled Vessels

A COMMON insulation problem confronting maintenance men and contractors, is the application of insulation material to vessels which, normally, are operated at low or freezing temperatures, and then at predetermined intervals, subjected to heating for thawing out purposes. This heat is commonly supplied by helical steam coils wound around the outside circumference of the vessel.

On vessels that operate at low temperatures for a relatively long period of time, it is of extreme im-

portance that a minimum amount of voids be present between insulation and vessel surfaces.

Steam coil windings on equipment of this type, present a difficult surface for the proper application of insulating material. Most materials commonly used in applications of this type are such, that tight fit over coils and the desired contact with the vessel surface are difficult to obtain.

A cellular glass product is obtainable which is designed for application to high or low tem-

perature surfaces. The structure of this material is such that by placing a block of it over coils, it can be easily and quickly fitted, by rubbing in a direction parallel to coils so that snug fitting grooves are formed, allowing the coil to fit therein, and at the same time bring the insulation material into close contact with the vessel surface.

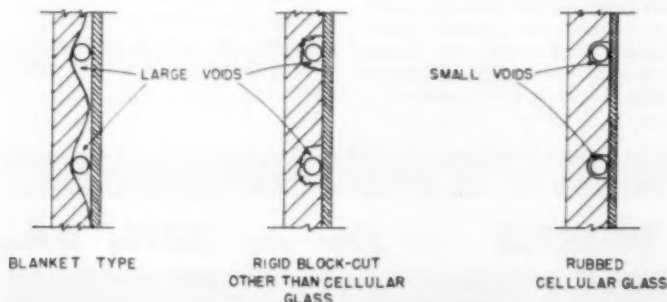
The simplicity of this fitting method eliminates costly measuring and cutting time, and allows said fitting to be done within a closer range of exactness.

The cellular glass material may be obtained in lagging form, beveled for specific radii, or curved and beveled for more precise installations.

When an installation of this type is to be made, attachment, sealing and finishing is done by standard methods established by the manufacturers, or others directly concerned.

This material offers a great degree of salvagability on replacement, ease of replacement, minimum damage due to cycling action and economy of application.

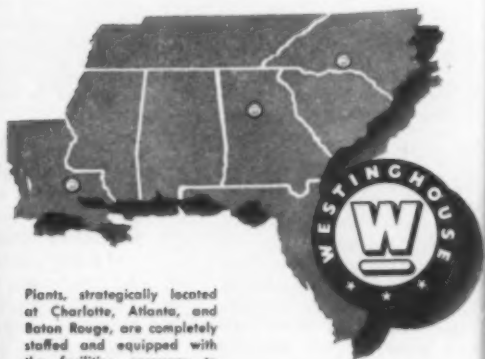
Sketches show comparison of fits on cellular glass, blanket and other types of insulating block.—WILLIAM D. PARKS, ASBESTOS & INSULATING CO., CHARLESTON, W. VA.



A Moving Picture of SOUTHERN INDUSTRY

Rapid industrial expansion such as the South is now experiencing, naturally is accompanied by basic problems of repair and maintenance. In its close relationship to the South, Westinghouse early met these problems by establishing in each of three principal Southern cities, a modern, fully equipped electrical repair shop. Each shop maintains a stock of renewal parts. Each has at its command the manufacturing and engineering facilities of the entire Westinghouse organization.

Pictured on this page are some of the varied facilities available to Southern plants through Westinghouse South. From the large lathes and presses, to the intricate panel and high frequency testers, each piece of equipment is operated by a skilled Westinghouse-trained workman. It is with such equipment and men—and through prompt, guaranteed repair work—that Westinghouse has become Electrical Repair Headquarters for Southern Industry.



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Apparatus Test Floor

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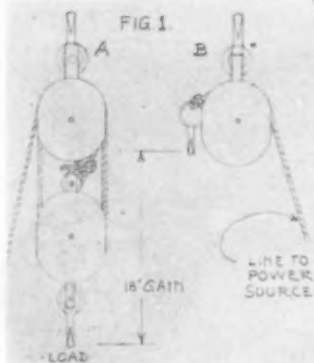
Insulation Drying and Baking Oven

Rigging Solutions—Under the Ceiling

By H. B. McDERMID

AS one old rigger expressed it "You don't lift heavy weights with your back, you raise them with your head; and six hundred tons goes into place just as easily as six hundred pounds if you rig for it." It happens that much of the writer's experience has been in maintenance work in plants which seldom had need for heavy weight handling in their daily work, and so were not equipped for such work when it was occasionally needed. Therefore material had to be handled by whatever method would serve the purpose—often under the most primitive conditions.

One interesting problem occasionally encountered in nearly all plants involves the placing of heavy weights up so close to a ceiling that ordinary standard hoisting apparatus is useless.



Problem 1

Our steel workers had some auxiliary steel to place close up under an existing ceiling. It consisted of some 8" I-beams of the heavier sections about 20 ft long, and their landing spot was so high that the usual rope blocks simply could not get them high enough. The gang labored mightily to place them by hand after hoisting as far as they could with the rope falls, but went home at night with only a half dozen placed. Next day a new gang boss showed up and

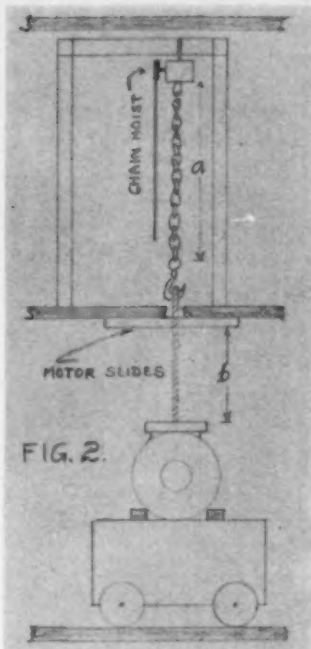
placed as many in an hour as the previous boss had done in a day. And except for addition of the smallest snatch block he could find, the last man used exactly the same men and equipment that the first had used.

The boss simply hung the lightest snatch block he dared use up as high as he could get it, where on account of its light weight it was easily placed (see sketch 1—showing wrong way at A and right way at B). Then he rove a single line through it, attached his I-beam to one end and the rope blocks to the other, using a suitable anchorage off to the side, and hoisted away, landing his load easily where it belonged, almost at once, because he now had about 18" more "drift" in his rig than the first man had, which was plenty.

I have since used this system dozens of times, often varying it, when a load was clumsy and bulky, by running the power line off horizontally to one side and passing it through a second snatch block on the way to some source of power.

Problem 2

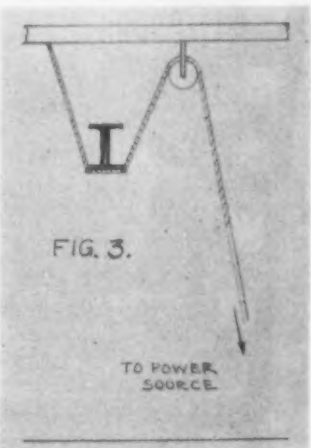
Another problem that sometimes shows up, is the hoisting of very heavy loads tight up against a ceiling. One such case was that of a slow speed 50 hp motor, whose guide rails had been installed bolted tight to the bottom of the upper floor slab. Luckily the next floor above was not being used just at the necessary spot, so we drilled a hole through the floor slab at a spot between the motor rails, rove a steel cable down through it, and attached it around the body of the motor. Then, on the second floor, we set a support as high as we could and hung a set of chain falls on it, taking care that the distance (a) as shown in sketch No. 2 was distinctly greater than the distance (b). This was partly accomplished by loading the motor on a high truck, before wheeling it to location.



A modern way to make such a lift (if the conditions permit) would be to block the load up on the forks of a lift truck high enough to give the rig great enough height, and then run the load and its blocking up to place. This would involve a clear space on the floor below the final landing spot of the load, a condition which does not always exist.

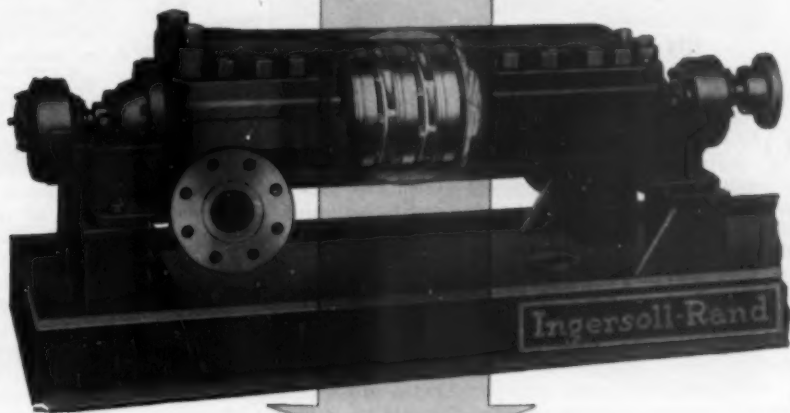
Problem 3

Where the problem is to place



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an I-beam tight against the ceiling, the beam can be raised with two slings, one at each end of the beam. This requires two attachments (sketch 3) for each line to the overhead support, but has the advantage that the top of the

weight can usually be hoisted higher than the top of the pulleys, because the hoisting line is placed under the bottom of the load. On such loads as a large pipe particularly, this rig is ideal, especially if the pipe does not have to

be placed any particular side up. On loads that must be exactly placed care must be taken to stop the hoisting before the sling draws too tight and turn the load to correct position before finishing the hoisting.

Ills of Quarter Turn Belts Corrected

QUARTER turn belts are prone to give trouble because of the side pull exerted and thus they may run crooked. One edge of the belt is stretched much more than the other and will in a short time cause the belt to become so badly misshapen as to ruin it. The lacing or metal clips, however, usually let go long before the belt fails to stay on the pulleys.

Where the belt centers are reasonably long the old bugaboo can be eliminated by turning the belt over in a half twist, or 180 de-

grees. This stunt causes the belt to change sides every other revolution and thus the wear is well distributed, plus equalizing the stretch and saving the expensive splices.

The planning engineer should have quarter turn drives arranged so that the centers are at least 5 times the diameter of the largest pulley. For example, if the large pulley is 20" D, the shaft centers should be at least 100" apart.

Well planned quarter turn drives will deliver their full horse-

power rating, yet it is good policy to use a belt 5 to 10 per cent wider to ensure long, trouble free operation.

Best operation is accomplished with the drive pulley on the vertical shaft—that is if one must be a vertical unit. This is explained by the fact that the tight side of the belt runs over the pulley, the plane of which is horizontal. Of course, where slackness is permitted to develop, trouble is not far off.

Where the vertical pulley is the driver and the belt runs off, taking up slack is one way to correct it. Should that fail the only alternative is to increase the crown on the pulley of the vertical shaft. —PAUL ZIEMKE, OAK RIDGE, TENN.

No Air Pockets Under Belts

NEVER yet have I come in contact with anything that even approached a trouble job caused by air pockets between belt and pulley. Nor do I know of any instance where, in belts of highest speed, it was found necessary to bore holes in the pulleys to aid the escape of air. The pulleys being round and also having some crown and the belt being flat, it is obvious that the air is "pinched out" and cannot possibly follow along with the belt.

The large natural outlet for air is so much larger in area than any holes that might be punched through the belt or pulleys that it is inconceivable that much air if any would flow through the holes. Air always follows the line of least resistance and that line of least resistance lies through the "natural outlet." Besides, the smooth side of the belt which is

always next to the pulleys will surely pull very little air along. By punching holes through the belt my guess is that the air currents set up by the belt will be "greater than ever." What is wanted most of all is a smooth belt having a high coefficient of friction.

All of us have seen high class belting on many high speed drives operating with a decided sag on the slack side, and yet there was no slip. When a belt sags it usually means that the pressure against the pulleys is very small. Hence if there were anything to the air pocket theory the air would follow the slack belt and lift it entirely from the pulley thereby causing slip and running off.

In Prof. Kammerer's belt tests at 12,000 fpm he did not experience air pocket trouble. I have never yet known of the air pocket

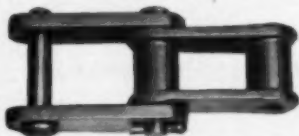
theory to be confirmed by any real scientist. In fact I can refer to actual government tests in which a flat belt gave much better results than a belt that was provided with so-called "air escapes." The tests on both belts were conducted on the same pulleys, and under other conditions that were as nearly identical as possible.

It is logical that a hard smooth-faced belt would carry very little air. That the belt is actually soft and pliable makes no difference so far as carrying air is concerned. Everything is dependent upon the smoothness of the surface. A rough canvas belt, for example, will carry more air than will leather. But air currents set up even by rough canvas belts are of no importance.

Grooving pulleys, drilling holes in pulley rims, punching holes through the belt, using air strips, using vacuum cups, and all such contraptions have been tried over and over, only to be abandoned. I have never found any of these "improvements" to be really worth while.—S. F. WORLEY, MISS.



Detachable Link—Malleable Iron, SUPERMAL or PERDURO



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'M' Type Mill—Malleable Iron, SUPERMAL or PERDURO



'400" Class Pintle



Malleable Roller—Malleable Iron, SUPERMAL or PERDURO

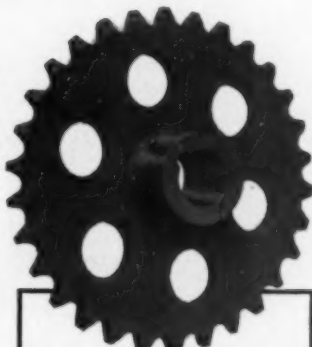


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Long Pitch Steel Thimble Roller with plain or flanged rollers



'800" Class Steel Bushed



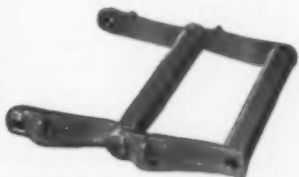
Steel Knuckle



Transfer



Steel Block in various types



'H" Type Refuse—Malleable Iron or SUPERMAL



A-1



F-2



H-2



K-2



A-42 with C-wing



G-6



S-1

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NEW EQUIPMENT for Southern Industry

Pneumatic Screwdriver

F-1 CLECO DIVISION of REED ROLLER BIT CO., Houston 1, Texas, has developed a new air-operated screwdriver, featuring a three-finger adjustable clutch with slip-impact action for final tightening of the driven screw.



This non-reversible screwdriver can be converted from a screwdriver into a nutrunner in less than half a minute without the use of special tools. Finders and bits can be changed without dismantling any part of the tool.

The tool has a capacity of $\frac{1}{4}$ -in. bolts and screws. A grip throttle controls operating speeds up to 1000 rpm and the three finger adjustable clutch, with sturdy slip-impact action assures uniform final tightening of the driven screw.

The screwdriver is 8 $\frac{3}{4}$ -in. overall and weighs only 2 $\frac{1}{2}$ lb. It is designed for use in tight places. Further information is available from the manufacturer.

High Temperature Insulation

F-2 OWENS-ILLINOIS GLASS COMPANY, Kaylo Division, Box 1035, Toledo 1, Ohio, has recently added curved block to its line of high temperature insulation. The range covers tubes and pipes from $\frac{1}{4}$ in. diameter to 72 in. and vessels up to 60 ft. This helps the user to reduce cutting and fitting during application.

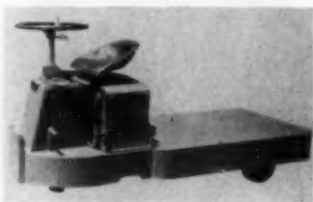
Kaylo heat insulation, made of hydrous calcium silicate which insulates



effectively up to 1200 F, is made in all standard sizes of block and in thicknesses from 1 in. to 6 in. for flat surface insulation. As pre-formed pipe covering, it is made in sectional form for all standard tube or pipe diameters from $\frac{1}{4}$ in. to 12 in.; tri-segmental form for pipes and tubes up to 41 in.; K-segmental for pipes and tubes up to 72 in.; and curved block nominally 18 in. wide for large vessels up to 60 ft in diameters. For diameters larger than 60 ft, flat block is used.

Freight Truck

F-3 THE MARKET FORGE COMPANY, Everett, Mass., is manufacturing a new battery-operated freight truck for use in plants as a pick-up or delivery truck.



The truck features 3-way operating positions which provide safety, comfort, and maneuverability. Large capacity cushion rubber wheels with sealed ball-bearings assure minimum drain on the battery. The unit is made in two models—3000 lb and 5000 lb capacity. It travels at 3.5 to 4 mph with no load. With full load, the 3000 lb truck goes at 3 mph and the 5000 lb at 2.5 mph.

The freight truck may also be used as a tractor and can be furnished with a suitable coupling when necessary.

Fire Extinguisher

F-4 BUFFALO FIRE APPLIANCE CORPORATION, Dayton, Ohio, has announced a new one-gallon vaporizing liquid fire extinguisher known as the Air-Flo. It oper-

Free additional information is available to readers of Southern Power & Industry. Check item number on the postage free service coupon post card—page 17.

ates on a new principle, in that big, dual air pumps build up internal air pressure which instantly forces the liquid out in a continuous, steady stream up to 30 ft. Light weight and easy to handle, the new extinguisher offers protection against electrical and flammable liquid fires.

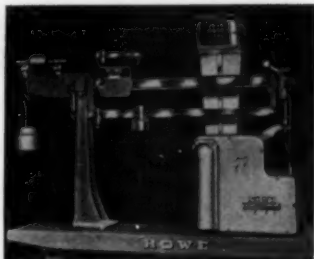
Sealed in an air-tight compartment, the vaporizing liquid will last for years—only annual inspection is necessary. Recharging can be accomplished on the spot.

Weighing Accessory

F-5 THE HOWE SCALE COMPANY, Rutland, Vermont, has developed the new Howe 77 Weightograph, a weighing accessory which can be attached to any make of beam scale, or to any scale convertible to beam operation, making an old-fashioned beam scale an "automatic" scale.

The device is simply attached to the beam shelf and connected to the beam with a rod. It features a non-protruding periscope with an eye-level screen which instantly flashes the exact weight in large, illuminated figures for easy reading. It is designed with methods of optical projection which increase image brightness and contrast five times. The image is read off the mirror instead of a ground glass screen. Reading line length is 180-in.

The unit weighs all the load at one time and shows the full load weight reading.



You can't go **WRONG!**

when you
come to
POWELL

When you install Powell
Valves according to Powell
recommendations, you can
be sure that you have the
right valves to meet the
actual service conditions

There's always a Powell Valve—
correct in design and materials—
for every flow control service.

*Quality fine
throughout
"The Line"*

Fig. 18013 W.E. Class 600-pound Cast Steel
Pressure Seal Gate Valve with welding ends
and by-pass equipped with 600-pound Steel
Integral Bonnet Angle Valve—Fig. 1333-A



POWELL

The WM. POWELL CO., 2525 Spring Grove Ave., P. O. Box 106, Station B, Cincinnati 22, Ohio

Portable Conveyor

F-6 SEEDBURE EQUIPMENT CO., 618 West Jackson Blvd., Chicago 6, Ill., has developed a portable folding conveyor for handling many kinds of products packaged in bags, boxes, bundles, bales



and cartons. One man can move it about and operate it. The conveyor is especially adapted to materials handling in warehouse aisles and other small areas, and for between-floor operations. It can be moved, or have the angle of delivery changed, while the conveyor is in motion.

The conveyor is made in five sizes, each of which folds to one-half its own length. Thus the largest model can be stored in an area less than a half-yard square.

The flow of materials may be reversed at any time while the machine is in operation simply by turning a switch. It can handle fifteen 100-lb bags per minute. Moving parts are concealed.

Paint Spraying Equipment

F-7 ASHDEE PRODUCTS, INC., 18029 Dixie Highway, Homewood, Ill., have announced a new electronic accessory for paint spray units. According to the manufacturer, this new unit operates on the electrostatic attraction principle which precipitates up to 95 per cent of the paint spray on the work, greatly reduces overspray, and cuts paint waste to a minimum. This is accomplished by establishing a nega-

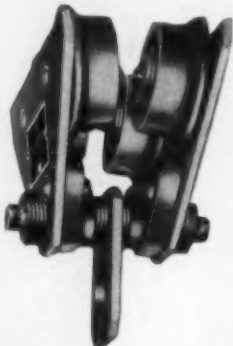


tive charge in the paint particles as they leave the spray gun. The paint spray containing the negative charge is then attracted to the item to be coated which is at ground potential.

With this method, spraying from one fixed position, allows the paint spray to reach around corners, cover top, bottom and hard-to-get-at places with a smooth, uniform coating.

Industrial Trolleys

F-8 WRIGHT HOIST DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC., York, Pa., has recently announced production of a new line of trolleys available from ½-ton to 3-ton capacity.



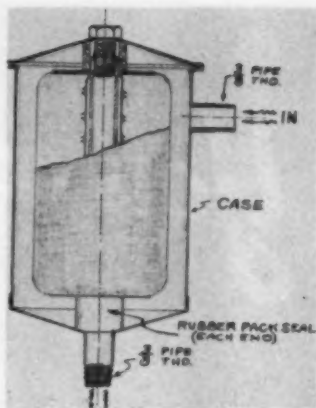
The trolleys are intended for use in industrial applications that do not require the high efficiency or high factor of safety of the company's other trolleys. The manufacturer states that they are reasonably efficient, easy rolling units that are safe and durable.

The trolleys feature: chilled tread wheels; husky roller bearings; heavy steel axles, equalizing pin and bracket strap; heavy fabricated steel side plates. The factor of safety is three to one minimum on all sizes and they are plain trolleys built only for standard I-beam sizes.

Filter Assembly

F-9 AUSTIN ENGINEERING & MFG. CO., 8275 San Jose Road, El Paso, Texas, is now manufacturing an all-purpose filter for cooling systems such as radiators and other systems for internal combustion engines, as well as cooling systems for other uses. Standard sizes are made for cooling systems of 6, 12, 25, 50, 100, 150, and 200 gal capacities. Special sizes are available for larger cooling systems.

The all-purpose water filter uses a replaceable cotton element that is treated with a vegetable compound



that goes into solution immediately, and begins protection and correction for scale and rust problems without delay. The filters are positive in action, are said to be safe to use and safe to metal, paint, clothing, and skin.

Electric Chain Hoist

F-10 ROBBINS & MYERS, INC., Springfield 99, Ohio, has recently developed a new electric chain hoist designed to apply modern handling methods to all types of handling operations. Available in ¼, ½ and 1 ton capacities, this new hoist is equipped with simple rope controls. Designed for hook suspension, it is adaptable for trolley mounting. The equipment is constructed of high strength cast aluminum alloy with heat-treated gearing and high carbon or alloy steel ground shafts.



Going...
Going...

GONE? No...not yet! But the familiar water tank *is* fast disappearing along the Southern Railway System. Why? Because Diesel locomotives don't "drink" from water tanks...and Diesels now move about 80 percent of our traffic.

Since 1940, the Southern Railway has spent more than \$125 million on Dieselization. A like amount has been spent for thousands of new freight and passenger cars and for all sorts of modern improvements and additions.

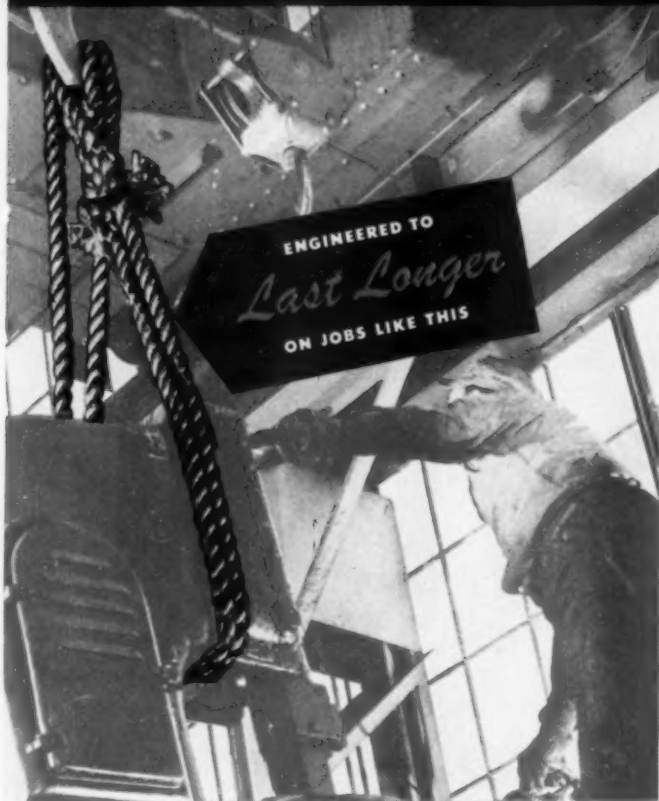
Because the Southern has kept pace with expanding civilian transportation needs of the growing Southland, it is better prepared than ever before to serve the South...better prepared to shoulder its full share of growing transportation demands of national defense.

Ernest E. Norris
President



SOUTHERN RAILWAY SYSTEM

For Greatest Rope Safety PLYMOUTH SHIP BRAND MANILA



THE TENSILE STRENGTH of Plymouth SHIP BRAND MANILA rope averages 25% higher than published "minimums" . . . provides a proportionately higher safety factor . . . extra protection against accidental overloads. The fiber quality and construction that help make this higher strength also mean longer service life, lower service costs, under normal operating conditions with the accepted 5 to 1 factor. Play safe and specify Plymouth SHIP BRAND—best rope buy for any industrial job.

PLYMOUTH

Cordage Products



ROPE AND TYING TWINE FOR INDUSTRY

PLYMOUTH CORDAGE COMPANY
881 Court Street, Plymouth, Mass.

Send informative booklets and charts to help
get more life from my ropes.

Name _____

Company _____

Address _____

Hydraulic Puller

F-11 OWATONNA TOOL COMPANY, Owatonna, Minn., has recently announced a new light-weight compact hydraulic puller weighing less than 10 lb and developing 15 tons of power.



The unit has a center hole which makes it adaptable to all of the company's pulling systems now in use. The center hole and twin cylinders make it possible for the puller to get at jobs heretofore inaccessible with a hydraulic ram. The unit is only 5½-in. high, and works in any position. The ram travels 2-in., which is adequate for 95 per cent of all the pulling jobs; another bite takes care of the balance.

Clamp Device

F-12 INDUSTRIAL TRUCK DIVISION, CLARK EQUIPMENT COMPANY, Battle Creek, Mich., has developed a clamp device for handling heavy, bulky loads without use of pallets. The device is for use on the company's Utilitrac models, both gas and electric powered with capacities up to 7000 lb, and on the Clark Yardlift-60, gas-powered pneumatic tired 6000 lb model.

The clamp is suitable for handling bales, large boxes and crates and other extra heavy, bulky units able to withstand the heavy squeezing. Clamping pressures up to 6000 lb at the heel of the arms are available.

The clamp is hydraulically actuated. The slide arms and guides are made from rolled channel sections of alloy steel. Separate double-acting hydraulic cylinders with piston rods actuate each clamp arm for extension and clamping. An auxiliary valve



Important points to know about COTTRELL Electrical Precipitators

A COTTRELL Electrical Precipitator is a major plant investment. Once installed it is operated over a period of many years, thus multiplying year after year the benefits of top notch design and installation.

And because of the many factors affecting the operating and collecting efficiency of a COTTRELL Precipitator, probably in no other field do the experience and "know-how" of the organization designing and installing the unit play a more important role in influencing the overall performance of the installation. That is why it is so important to remember this fact . . .

Western Precipitation Corporation is the organization that installed the first successful COTTRELL Pre-

cipitator over 39 years ago, still operating efficiently . . . and has consistently developed new refinements, new techniques, new applications that today have made it world famous in the science of recovering dusts, fly ash, mists, fogs and other suspensions from gases.

This is the first of a series of advertisements briefly outlining the important elements that go to make up a COTTRELL installation. Only long experience coupled with highest engineering ability, can assure the proper combination of these elements into a COTTRELL installation best suited to your particular requirements!

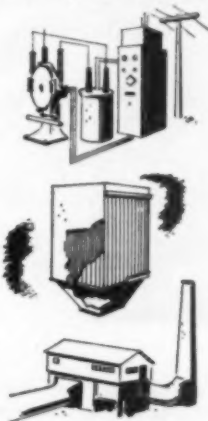
Basically, a Cottrell Precipitator consists of three major divisions each in turn consisting of many separate elements . . .

1. THE ENERGIZING SYSTEM, as its name implies, is the portion of the unit wherein the power is brought in, the voltage stepped up, then rectified to provide the unidirectional high voltage current supply for the Electrode System.

2. THE ELECTRODE SYSTEM consists of the high-tension ionizing electrodes and collecting electrodes through which the suspension-laden gas is passed to be cleaned. These electrodes can be of various designs, shapes and patterns and are equipped with various "rapper" arrangements which assist in keeping the electrodes clean of recovered materials.

3. THE HOUSING OR SHELL includes the structure containing the Electrode and Energizing Systems as well as the gas ducts and distributing system, the hoppers for receiving the collected material and other miscellaneous equipment.

Each of these three major divisions, together with their many individual parts, must be carefully engineered into ONE integrated and precisely-balanced unit to provide the successful and continuously-operating COTTRELL Precipitator. This series will take these major units apart to show in greater detail how the individual parts function and the varying types of design and construction. Watch for them.



10 COTTRELL ADVANTAGES

that make Cottrells unsurpassed for all types of recovery problems, hot or cold, wet or dry

- 1. LOWEST DRAFT LOSS** — only a few tenths of an inch w. g.
- 2. LOWEST POWER COST** — only 1/2 to 1 kw. per 100,000 cu. ft. of gas cleaned.
- 3. LOWEST MAINTENANCE COST** — all metal, few moving parts, no fire hazard.
- 4. LOWEST LABOR COST** — operation can be fully automatic, if desired.
- 5. LONGEST LIFE** — early Cottrell installations still operating after 39 years of continuous service.
- 6. HIGHEST EFFICIENCY** — recovery efficiency approaches 100%, if desired.
- 7. UNIVERSAL APPLICABILITY** — recover any suspension, solid or liquid — in any gas — over wide temperature ranges.
- 8. ANY CAPACITY** — handle a few c.f.m. — or millions — with equal ease.
- 9. MAXIMUM FLEXIBILITY** — readily adaptable to varying installation requirements.
- 10. LOWEST OVERALL COST** — cost less per year of service, less per ton recovered. Often pay for themselves in a few months — always within a few years.

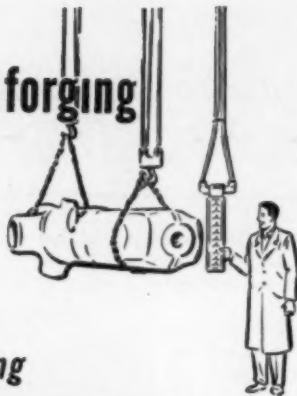
WESTERN
Precipitation
CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR
COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

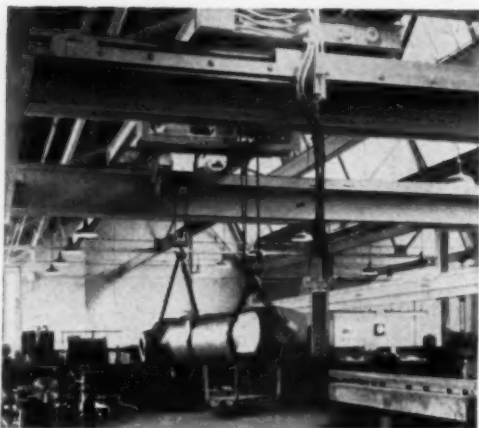
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Do You Have This Helpful COTTRELL Booklet? In 28 pages of interesting charts, illustrations and descriptive data, it answers many of the questions engineers ask about COTTRELL design and construction. Send for your free copy. Ask for Bulletin C181!

B-36 shock strut forging



*makes two point landing
with R & M flight control*



At Cleveland Pneumatic Tool Co., one man "flies" these 8400-lb. forgings into position between lathe centers by means of a 10-button "flight control" panel.

This control enables the operator to raise or lower the hooks on the two electric hoists independently or simultaneously a fraction of an inch at a time, and also control the double girder 4-motor overhead traveling crane—a big advantage in handling these giant forgings with a light touch.

Whether you are handling guns or butter, *take it up with R & M.* An expert survey of your requirements by our nearby R & M representative involves no obligation, and usually results in faster products handling—for less money.

Write for bulletin SS1P.

TAKE IT UP WITH
ROBBINS & MYERS INC.

HOIST AND CRANE DIVISION, SPRINGFIELD 99, OHIO

MOTORS HOISTS CRANES
FANS MOYNO PUMPS

controls the clamp, and a check valve is incorporated in the hydraulic system as standard equipment to prevent loss of clamping pressure.

Clamp arms can be extended from a minimum opening of 24-in. to a maximum opening of 95-in.

Ball Type Joints

F-13

THE CURTIS UNIVERSAL JOINT CO., INC., Springfield, Mass., has announced the development of a new "Ball Type" Universal Joint. Lower in price than the company's line of standard joints, the ball type joint is designed for light duty applications, and is available in four sizes: $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1" and $1\frac{1}{4}$ "—single or double, solid or bored hubs.

The new joint has steel forks bearing upon a bronze ball, with heat-treated centerless ground pivot bearing pins. The large pin is equipped with patented oiler, riveted small pin.

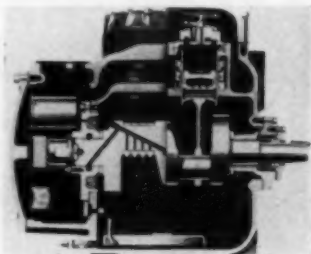
Reciprocating Compressors

F-14

THE TRANE COMPANY, La Crosse, Wis., has developed a new line of reciprocating compressors, designed for comfort and process applications. The new compressors are built in 10, 15, 20, 25, 40 and 50 ton capacities. Complete condensing units are also made in each size.

The compressors require no special foundations, floor construction or soundproofing. Noise is reduced through use of plastic cushioned valves, aerodynamically designed suction and discharge gas passages, and location of all parts of the capacity control system within the compact, cylindrical body.

According to the manufacturer low power consumption results from the high volumetric efficiency of the basic design, and the completely automatic, internal multi-step capacity control or unloading system. Long life and low maintenance costs are said to result from the enclosed force-feed lubricating system.





TOUGH LAYOUTS

- ✓ Assured Safety
- ✓ Efficient Operation
- ✓ Minimum Fuel Costs
- ✓ Low Maintenance
- ✓ Long, Trouble-Free Life



MADE SIMPLE BY NAVCO

The high degree of skill acquired by Navco Engineers from long experience in solving unusual Piping problems is your guarantee of an accurate and workman-like Piping System.

Consult Navco for your next Piping Job

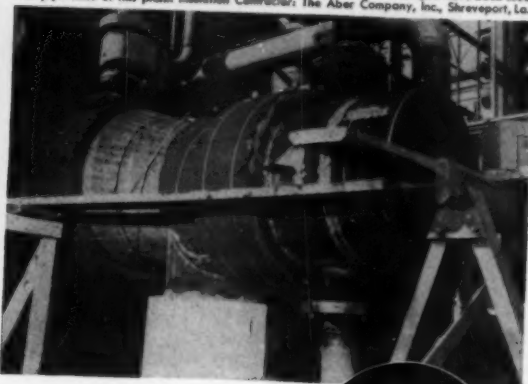


NAVCO PIPING

NATIONAL VALVE & MANUFACTURING COMPANY • PITTSBURGH, PA.

NEW YORK • CHICAGO • CLEVELAND • BOSTON • ATLANTA • TULSA • BUFFALO • CINCINNATI

THIS PROCESSING EQUIPMENT at the new oxidizer plant of McCarthy Chemical Company, Winkle, Texas, is being insulated with PC Foamglas. In addition to curved segments, beveled flange and standard flat blocks an equipment, preformed sections of Foamglas have been used on pipe lines at this plant. Insulation Contractor: The Aber Company, Inc., Shreveport, La.



**It costs you
less money**

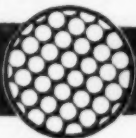
**PC
FOAMGLAS**
the long life
insulation

The wide acceptance of PC Foamglas—evidenced by a long list of prominent users—is due mainly to two facts. It is an effective insulation. It is an economical insulation.

The cellular glass structure that makes Foamglas such an exceptionally effective insulation also makes it the long life insulation. Since glass is practically impervious to elements that destroy other materials, PC Foamglas—when properly installed—retains its original insulating effectiveness.

Foamglas is giving many years of trouble-free service on hot and cold piping and fittings—indoors and outdoors—on towers, tanks, and processing equipment. Its freedom from costly maintenance, repairs and replacement is another important factor in keeping insulating costs down to rock bottom.

When next you figure on insulation, consider the money-saving advantages of Foamglas on a cost-per-year basis. If you are facing special insulating problems, our specialists will be glad to consult with you. Meanwhile, you will find a lot of helpful information in our current literature. Just send in the convenient coupon and your selection of our booklets will be forwarded promptly, with a sample of PC Foamglas.



THIS MAGNIFIED DIAGRAM shows that PC Foamglas is composed almost entirely of still air, which is sealed in minute glass cells. The black areas indicate glass, the white areas air. The insulating properties of still air and the unusual resistance of glass to moisture, chemicals and other elements that cause insulation to deteriorate, make Foamglas an exceptionally effective, long lasting insulating material.

Pittsburgh Corning Corporation
Dept. AE-51, 507 Fourth Avenue
Pittsburgh 22, Pa.

Please send me, without obligation, a sample of Foamglas, and your FREE booklet on the use of PC Foamglas for industrial insulation.

Name.....

Address.....

City..... State.....



FOAMGLAS cellular glass **INSULATION**

When you insulate with FOAMGLAS... the insulation lasts!

Plate Edge Preparation

F-15 AIR REDUCTION, 60 East 42nd St., New York 17, N. Y., has announced the availability of a new plate-edge preparation device. The equipment has been designed to increase production and insure clean-cut, accurate preparation of plate edges. Its ability to cut a single or double bevel accurately, with or without a land, recommends it especially for use in shops or factories which do any amount of steel fabrication work.

The device, which employs a spring-balanced, free floating carriage and castor-wheel assembly to permit bevel cutting over plate undulations while maintaining a constant tip-to-work distance, may be mounted on any gas cutting machine equipped with a 3" square torch bar.

Torches may be individually positioned vertically or laterally without changing the bevel angle. Fuel and preheat pressures are initially set with individual torch valves, and once set, the master valve controls turning-on and shutting-off gas supply without disturbing settings of the individual torch valves.

Portable Electric Tool

F-16 WODACK ELECTRIC TOOL CORPORATION, 4627 W. Huron St., Chicago 44, Ill., has announced a combination portable electric hammer and drill. Its one motor is utilized for performing three different types of work: drilling concrete and masonry; drilling metal and wood; and driving, grinding, buffing and wire wheels.

The tool is fully equipped with ball-bearings with sealed lubrication. The hammer member may be taken apart for cleaning and greasing, and the switch and carbon brushes can be replaced quickly.



The equipment is operated by a universal motor with fan ventilation, and the switch is located in the handle. It is designed for use with either direct or alternating current of from 25 to 60 cycles. The body of the unit is made of aluminum alloy and weight is 15 lb.

Unit Substation

F-17 GENERAL ELECTRIC COMPANY, Schenectady 5, N. Y., has announced a new mid-gest load center unit substation specially designed for low-voltage, regulated a-c lighting and power service in factories and laboratories.

Called an Inductrol Power Pack, the unit incorporates in one steel housing an air circuit breaker, a dry-type transformer, and an air-cooled induction regulator.

The new pack, available in either single-phase or three-phase ratings, has a capacity ranging from 15 to 100 kva, with incoming circuit rated 480 or 600 volts, 60 cycles, and a regulated output at 120/240 or 208Y/120 volts. With these power regulating units, power can be brought to the load area at relatively high voltage with substantial savings in cable. At the load center, the voltage is stepped down to the value required by the load being served and automatically maintained at that level. This assures maximum life and optimum performance of this connected equipment.

In addition to lighting, the unit can be used to regulate the power supplied to resistance heating and infrared heating equipment, electronic apparatus, precision instruments and control circuits.


Industrial Oil Burner

F-18 THE COPPUS ENGINEERING CORPORATION, Worcester, Mass., has announced the marketing of a new Coppus-Dennis FANMIX Oil Burner, which is said to have the following six major advantages: increased boiler ratings, increased fuel efficiency, elimination of hot spots, elimination of forced draft equipment, a cut in stack requirements and reduced coking of atomizers.

The new burner utilizes steam under pressure to atomize oil into the smallest possible particles. These particles are then discharged through rapidly rotating orifices and thrown outward into a cylindrical "sleeve" of air. This air-

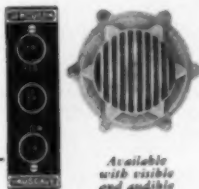
**BOILERS ARE SAVED BY KNOWING
THE WATER LEVEL.**

Some operators have to guess.
Some need a telescope to see
the gage glass from the floor.
Others have to be satisfied with
an approximation.
BUT



JERGUSON
TRUSCALE
GAGE

Model 22 duplicates
water level as shown
in gage glass at boiler



Available
with visible
and audible
alarms at
auxiliary
points

Marine Operators: Special
installation procedure com-
pensates for roll and pitch
of your ship.

**You KNOW
The Water Level
When you have a**

JERGUSON TRUSCALE GAGE

THE Jerguson Truscale Gage for remote reading of boiler and other liquid levels is **ACCURATE** to $\frac{1}{2}$ of 1% of scale reading.

It is **DEPENDABLE**, for it works on hydrostatic heads directly from the boiler drum. Simple in design, with magnet external to manometer system, and feather-light pointer system. All internal moving parts of stainless steel; no stuffing boxes.

Models for any pressure and range; illuminated dial; scale markings and pointer glow in the dark.

*Write for full information
on Jerguson Truscale Gages*

JERGUSON

Gages and Valves
for the Observation
of Liquids and Levels

Representatives in Major Cities
Phone Listed Under JERGUSON

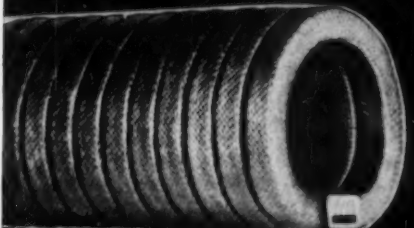
JERGUSON GAGE & VALVE COMPANY
100 Fellsway • Somerville 45, Mass.

European Mfg. Affiliate: Bailey Meters & Controls, Ltd.

IT WON'T ESCAPE . . . IF IT'S BELMONT SEALED!



BELMONT 189 . . . for cold and hot oil rods and plungers.



BELMONT 19 . . . for hot and cold water rods and plungers; low and intermediate steam rods.

BELMONT 30 . . . for high pressure steam rods, expansion joints, air, and gas.

BELMONT Packings, unlike "run of the mill" packings, are the remarkable, trouble free, product of packing specialists who have devoted more than half a century to the problem of producing packings with a *Better Seal and Longer Life*.

Today, more than ever before, production schedules must be maintained without interruption. Your insurance against service interruptions and mounting maintenance costs due to packing failure is BELMONT; the Packing that will withstand the ravages of TIME as well as Steam, Water, Oil, Gas, Air, Alkalies, Ammonia.

There's a Belmont Packing for EVERY SERVICE . . . hundreds of styles enable you to select the correct basic raw materials and constructions to suit individual job requirements. Packed in the blue box with the orange colored trade mark, Belmont **BETTER SEALING . . . LONGER LASTING** Packings are available through distributors everywhere. RINGS, SPIRALS, COILS, REELS, SPOOLS, SHEETS and GASKETS. For special engineering help, write direct.

THERE'S A BELMONT PACKING FOR EVERY SERVICE

**THE BELMONT PACKING
AND RUBBER CO.**

Butler and Sepviva Streets
Philadelphia 37, Pa.



Catalog #40 is available,
write for it.

4-L-1

fuel mixture is projected into the furnace by a fan, which is rotated by the jet reaction of the steam-atomized oil. This violent mechanical mixing of the atomized oil and air brings the oxygen molecules together with the hydrocarbon molecules of the fuel, resulting in rapid and complete combustion and consequently a very short flame pattern.

The oil burner is so designed that the fan's power requirement coincides with the power developed from the reaction force of the steam atomized oil. If the amount of fuel is increased, the speed of the fan increases, thus automatically maintaining the proper fuel-air ratio.

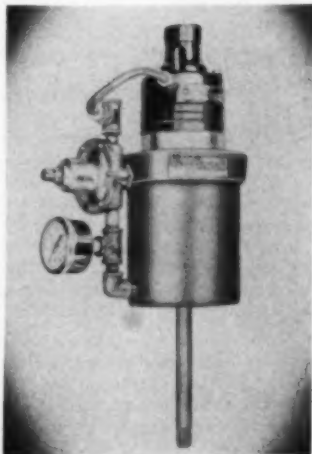
Pneumatic Cylinders

F-19 CONOFLOW CORPORATION,
2100 Arch Street, Philadelphia 3, Pa., has announced

a new series of pneumatic cylinders for throttling control service. The cylinders consist essentially of a new design of "O" ring sealed pneumatic cylinder with a piston positioner integrally mounted in the head plate.

The unit itself is a bucket-type cylinder of cast aluminum. A one-piece piston is fitted with a graphite-impregnated "O" ring, designed to provide a perfect seal with a minimum of friction. Head plate and piston stem are also "O" ring sealed, eliminating head bolts and gland packing.

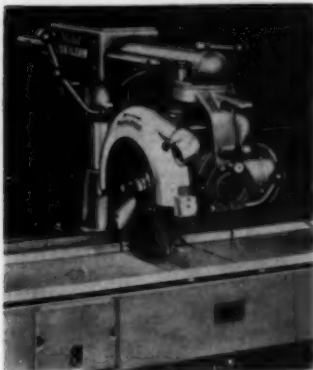
The positioner is integrally mounted on the head plate, and takes its position by means of a contact spring riding on the piston. The cylinders in the new series are suitable for use with air supply pressures up to 100 psig and are said to be capable of repositioning accuracies to 1/500th part of the total travel.



For more data circle item code number
on the postage free post card—p. 17

Radial Saw

F-20 SKILSAW, INC., 5033 Elston Ave., Chicago 30, Ill., has developed a new, special-feature radial saw. The new model is said to be a complete woodworking



shop incorporated in one unit. The manufacturer states that difficult bevel, miter, rip, dado, plough and rabbet cuts are made quickly, easily, and accurately with this saw.

The model is available with either manual or magnetic controls. Special stops automatically set the saw at more common cutting angles.

The new radial saw is made in a variety of voltage, horsepower and motor cycle specifications with either 14 in. or 16 in. blades. It requires a floor space of 4½ ft x 6 ft and weighs 475 lb. The work table is 11¼ in. deep and may be increased to 13¼ in. if desired.

Rubber Lined Valve

F-21 R-S CORPORATION, 4600 Germantown Ave., Philadelphia 44, Pa., has developed a rubber lined valve for emergency gas or liquid shut off service. With the angular seating vane for wedge type closure, the rubber is compressed around the periphery of the vane to give position shut-off even around the shaft bosses. This type of construction makes it possible to use an iron body valve in service that would normally call for stainless steel or other alloy. The rubber flanges take the place of the usual flange gaskets.

The valve is completely cycled and operated by a directly connected motor driven pump, sealed in oil. The hydraulic pressure raises the counterweight for the open position. When the valve is fully open, operating motor is cut off by integral switch. While

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DARTS are your
best buy!

To get top resistance to stress and stretching, we've made body and nut of high-test, air-refined malleable iron.

Special oscillating grinders give these non-corroding bronze seats a true bearing surface.

No danger of deforming or stripping with full, clean-cut threads like these.

Extra width of seats ensures a drop-tight joint without excessive wrenching.

It's an extra heavy nut so it'll easily shrug off careless wrenching.

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UNION COMPANY

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Gone are the mules and primitive mining methods of 1907. Today, Southern's modern mines bring you a wide selection of carefully prepared coals. Symbolic of these changes are giant haulers which carry coal from open pit to preparation plant.

SOUTHERN supplies the right coal **to LOWER YOUR STEAM COSTS**

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When coal is precisely fitted to the individual requirements of specific types of burning equipment, it invariably steps up boiler efficiency and substantially reduces your steam costs... On-the-job surveys and actual burning tests by Southern's fuel engineers have demonstrated this fact in plant after plant.

Southern ships a wide range of precision-sized, uniform quality, scientifically washed coals—a supply continuously reinforced from Southern's vast reserves. Production is big—in excess of 10,000,000 tons annually.

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Industrial buyers choose from a wide variety of premium coals efficiently mined and scientifically processed in the coal fields of Western Kentucky, West Virginia, Virginia, Eastern Kentucky, Illinois, Indiana, Alabama, Arkansas and Oklahoma. One is right for your equipment.

A TESTED COAL TO MEET EVERY INDUSTRIAL REQUIREMENT



Southern Coal Company, Inc.

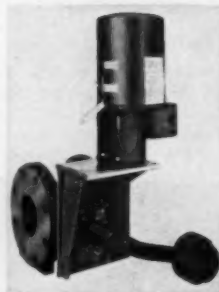
General Office: 333 North Michigan Avenue, Chicago 1, Ill.

Offices in: ATLANTA, BIRMINGHAM, CHARLOTTE, CHICAGO,

KNOXVILLE, LOUISVILLE, MEMPHIS, NASHVILLE, ST. LOUIS

Sinclair Coal Company, Kansas City 6, Mo.—Western Representative

Boon-Strachan Coal Company, Ltd., Montreal—Canadian Representative

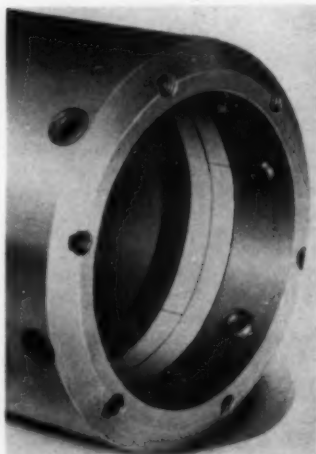


the operator is energized, current consumption drops to a minimum. Should current fail, the oil operator is released, the counter-weight drops and the valve is closed. Valve action can be reversed. Sizes are from 2 to 72-in.

Pipeline Coupling

F-22 THE E. H. WACHS COMPANY, 1526 N. Dayton St., Chicago 22, Ill., is producing new pipeline coupling for rejoining of crude oil, gasoline, L. P. gas and gas pipelines. The manufacturer claims that special design and construction permits the effective sealing of pipe from 2 in. to 36 in. in diameter in a matter of minutes. Full pipeline pressure can be restored immediately and welding done after line is back in service saving down time and cutting product losses and labor costs.

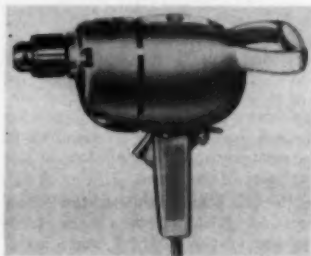
The safety feature of the coupling makes it possible to rejoin high pressure steel pipelines under hazardous conditions without using a torch, because of the use of a mechanical seal with neoprene rings.



For more data circle item code number
on the postage free post card—p. 17

Heavy Duty Drills

F-23 CUMMINS PORTABLE TOOLS,
Division of Cummins-Chicago Corporation, 4740 N. Ravenswood Ave., Chicago 40, Ill., is producing two new heavy duty drills—a ¼-in. and a ½-in. model.



The ¼-in. drill is designed for constant production drilling of tough metals. Specifications include ¼-in. capacity in metal, ½-in. in hard wood; no-load speed 1750 rpm; Jacobs Model 7B geared chuck; length 12¼-in.; weight 6 lb.

Slightly heavier and with the right speed for fast drilling in all metals, the ½-in. model is said to have ample power and ease of handling needed in production and maintenance operations. Specifications include, ½-in. capacity in metal, 1-in. in hard wood; no-load speed 750 rpm; Jacobs Geared chuck, Model 32B; length 13¼-in. overall; weight 8½ lb.

Vertical Pump

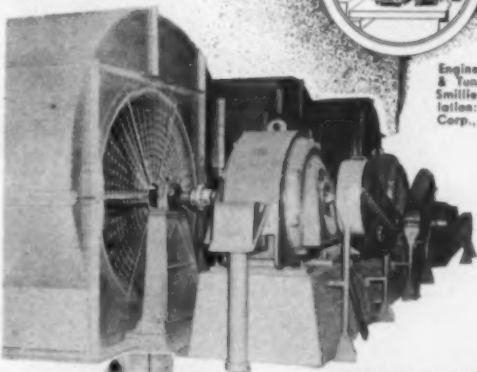
F-24 BYRON JACKSON COMPANY, P. O. Box 2017 Terminal Annex, Los Angeles 54, Calif., has developed a small, strictly standard, vertical pump, furnished with pipe tap suction and discharge nozzles, Type U mechanical seal and standard materials. The new pump has been designed and developed for general industrial applications, and, because it incorporates the company's mechanical seal, it is said to be especially well suited for the handling of butane, propane, gasoline, and petroleum products generally.

It is built in one barrel size, in which either an open or closed impeller bowl assembly can be installed. By omitting the barrel, the unit is suited for sump or tank pump service.

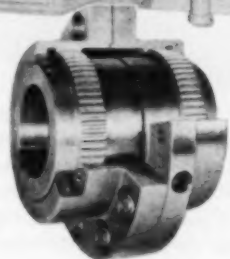
The barrel is constructed of 6 in. standard pipe, flanged at the top for connection to the nozzle head. A motor flange is provided to receive solid shaft motors from 1½ hp to 10 hp

...consistently specified for the
outstanding engineering projects

World Famous BROOKLYN-BATTERY TUNNEL

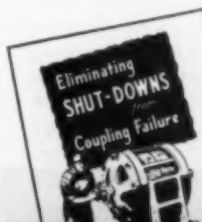


Engineering: Tri-Boro Bridge
& Tunnel Authority — Ralph
Smithie, Chief Engineer. Ventila-
tion: Westinghouse Electric
Corp., Sturtevant Division.



WALDRON the advanced gear type Coupling

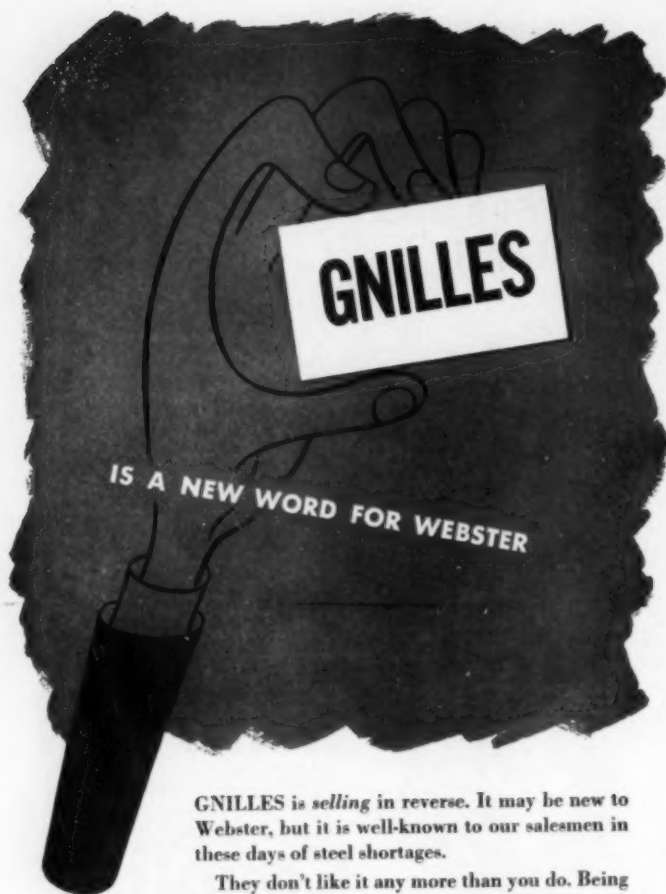
To insure dependable and continuous expulsion of deadly exhaust gases in America's longest vehicular tunnel required the best in engineering skill, ventilating apparatus and power driving equipment. More than 100 Westinghouse motors drive the huge Westinghouse fans and to secure the maximum assurance to continuous trouble-free service WALDRON Couplings were selected for each drive. No finer testimonial to the all-around quality of the WALDRON Coupling could be had than their selection for this notable engineering project.



Write for your copy

of this new folder which explains in detail the common sources of coupling failure and how they can be avoided. Useful information for every coupling user. Copy will be sent promptly on request.

MANUFACTURED BY
JOHN WALDRON CORPORATION
New Brunswick, New Jersey
Sales Representatives in Principal Cities.



GNILLES is selling in reverse. It may be new to Webster, but it is well-known to our salesmen in these days of steel shortages.

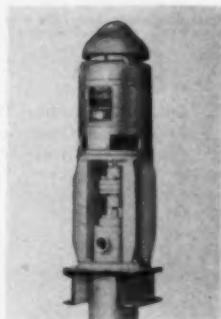
They don't like it any more than you do. Being salesmen, it goes against the grain. They'd much rather be out there selling.

But today, that's out. So they are devoting their time trying to keep customers satisfied; helping them to arrive at suitable substitute steels; advising them on availabilities; keeping up with latest government regulations; helping make allocations on a fair and equitable basis.

They are anxious to help you in any way they can, so feel free to call on them and us.



Our Warehouse Division is guided by the same business principles which have carried Atlantic Steel Company through fifty years of progress.



inclusive at 3550 rpm. An adjustable flanged type coupling is supplied to permit easy and accurate lateral adjustment of impellers.

The pump has a maximum working pressure of 350 psi, a maximum pumping temperature of 250 F, and a maximum capacity of 1000 gpm.

Electric Fork Truck

F-25 ELWELL - PARKER ELECTRIC Co., 4162 St. Clair Ave., Cleveland 14, Ohio, has announced a single-cylinder, low-pressure, double-action hydraulic hoist system in a new 6000-pound capacity electric battery fork truck.

The truck is said to feature faster, smoother action in lifting and lowering a load; a cushioning effect between truck and load due to the hydraulic mechanism; automatic protection against overload; precision control of fork and load by the driver at any height of load elevation.

Hoisting mechanism has been simplified; there are fewer moving parts than in multiple chain-drive hoists; servicing is easier and maintenance costs lower. Electric power, plus sealed-in, self-lubricating motors, hoisting apparatus and hydraulic sys-



For more data circle item code number on the postage free post card—p. 17

tem reduce friction to a minimum and assure a degree of cleanliness for the machine, loads and floors seldom attained in high-lift trucks.

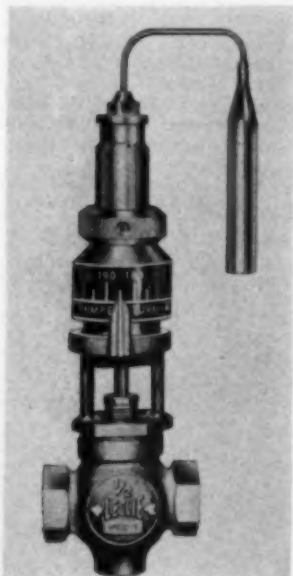
The hydraulic cylinder is centered in the hoist frames giving increased visibility of load and travelway. The hydraulic pump for hoist and tilt is direct connected to an electric motor, independent of truck's travel motor.

Overall height of upright's telescoped is 83-in.; fully extended 145-in.; maximum lift of fork 126-in. Length overall of truck with 36-in. fork is 118-in.; width overall 42½-in. Hoist speed for full load is 20 fpm going up, 40 ft going down; without load 40 ft going up and 36 fpm going down. Travel speed with full load is 5 mph.

Calibrated Dial

F-26 **LESLIE COMPANY**, 369 Delaware Ave., Lyndhurst, N. J., has announced a new calibrated dial for use with the company's temperature regulators.

The new calibrated dial is designed to provide protection against overheating caused by guess work. It is easily installed on Class T and Class M type regulators, including those already in service. The dial fits in place of standard adjusting sleeve. According to the manufacturer there are no complicated linkages or gages to go out of order or to add friction.



KENNEDY

Fig. 544P



JOB-FITTED

for longer disc and seat life... where accurate control is a must

Like all valves in the complete KENNEDY line these bronze globe valves are **JOB-FITTED** . . . specially designed and engineered for the job they have to do!

UNION BONNET RING, heavy bronze section with extra thread engagement to assure a tight joint. Union bonnet makes a valve easy to dismantle and reassemble.

STEM, Naval Brass Rod, Acme threads, large diameter with extra thread contact . . . extremely resistant to wear.

PACKING, molded rings of graphited, wire-inserted asbestos designed for high pressure service.

PLUG TYPE DISC, nickel copper alloy, has extra wide seating surfaces for precise throttling control . . . is exceptionally resistant to scouring or wire drawing.

RENEWABLE SEAT RING, nickel copper alloy, ground to match disc in each valve to assure full bearing surfaces over entire contact area of each.

KENNEDY Fig. 544P, plug type disc, and **Fig. 544**, full-way disc, are designed for 300 lbs. steam, 600 lbs. WOG. **Fig. 138P**, plug type, and **Fig. 138**, full-way disc, for 200 lbs. steam, 400 lbs. WOG.

WRITE FOR BULLETIN 108



THE

KENNEDY
VALVE MFG. CO. • ELMIRA, N.Y.

VALVES • PIPE FITTINGS • FIRE HYDRANTS

These
EVERLASTING
advantages

give
better
service
from



Fig. 4001/6561. Duplex unit consisting of Straightway Lever-operated Sealing Valve and Angle Blowing Valve.

BOILER BLOW-OFF VALVES

When you install an EVERLASTING Duplex Blow-Off Unit, you'll find that its many superiorities speak for themselves.

The sealing valve at the left is the EVERLASTING design that has been famous for more than 40 years . . . the valve with the drop-tight seal that actually improves with use because of its self-lapping action each time the valve is opened or closed . . . the valve that can't stick or jam because of its non-wedge design . . . the valve that opens in less than a quarter turn to provide unimpeded straight-through blow.

The blowing valve at the right is the equally famous EVERLASTING Angle or "Y" Valve, specially designed and equipped to withstand repeated blow-off shocks, erosion and corrosion, and without pockets that might trap and hold solids.

Each of these valves . . . and all the other EVERLASTING Boiler Blow-Off valve types, fully meet ASME code requirements . . . assurance that they are properly designed and amply strong for the service.

Write for descriptive bulletin

EVERLASTING VALVE CO.
49 Fisk Street, Jersey City 5, N. J.

Everlasting Valves

TRADE MARK "EVERLASTING" REG. U.S. PAT. OFF.

FOR EVERLASTING PROTECTION

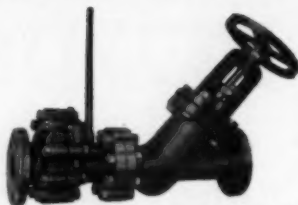


Fig. 4001/6571. Duplex unit consisting of Straightway Lever-operated Sealing Valve and Y Blowing Valve.

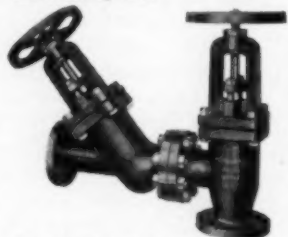


Fig. 4571/6561. Duplex unit consisting of Y Sealing Valve and Angle Blowing Valve.

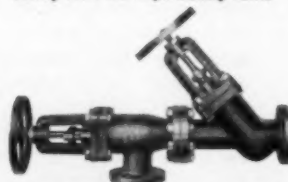
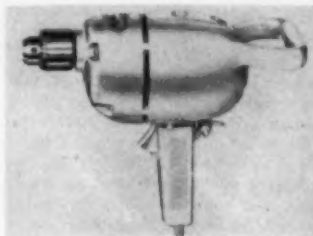


Fig. 6561/6571. Duplex unit consisting of Angle Sealing Valve and Y Blowing Valve.

Industrial Drill

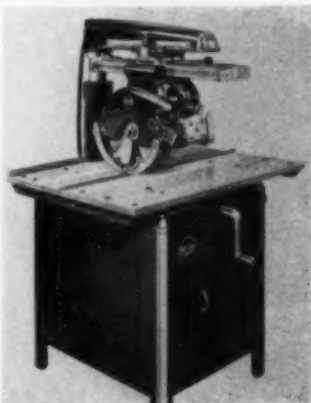
F-27 CUMMINS PORTABLE TOOLS, Division of Cummins-Chicago Corporation, 4740 N. Ravenswood Ave., Chicago 40, Ill., is producing a new 1/4-in. drill equipped with anti-friction bearings, and designed for heavy duty in factories and shops.



Specifications included: capacity, 1/2-in. in metal, 1 1/2-in. in hard wood; no-load speed 550 rpm; Universal motor ac-de up to 60 cycle, 115 volts, 220 volts special; high grade ball and roller bearings; double reduction gears of finest alloy steel, helical cut and hardened; 2-pole switch, monetary contact with lock for continuous operation; geared chuck, model 33B—key mounted on drill handle with spring clip; die-cast aluminum frame; length 13 1/2-in. overall; weight 8 1/2 lb.

Radial Arm Saw

F-28 DELTA POWER TOOL DIVISION, ROCKWELL MANUFACTURING Co., Milwaukee 1, Wis., has announced a new radial arm saw. New features of the model include: automatic locating latches at 0, 30, 45, 60, and 90 deg; totally enclosed, Fiberglas insulated direct-drive motor; Lifetime Nitralloy trackways; pivot-point slide that keeps saw kerf above work top. Safety



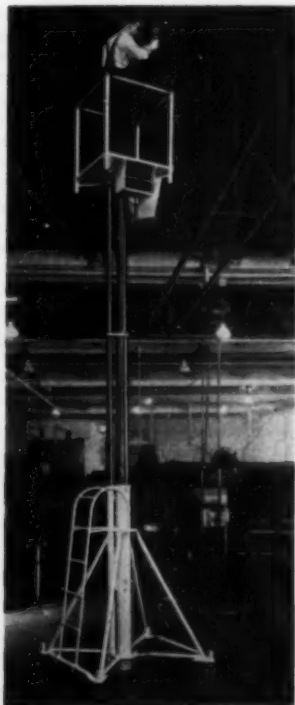
guard that has splitter with kick-back fingers.

The new radial arm saw is available in 3 types: (1) Portable, with hand grips; (2) Mobile, mounted on a rubber-tired trailer; (3) Stationary, mounted on a cabinet-type base. These types are available in several sizes: $\frac{1}{2}$ -5 hp; 1-phase a-c; $\frac{3}{4}$ -7 $\frac{1}{2}$ hp, 3-phase a-c.

Work Tower

F-29 SAFWAY STEEL PRODUCTS, INC., 6234 W. State St., Milwaukee 13, Wis., has developed a new electro-hydraulic work tower, controlled by a foot-operated lever on the platform. It can be raised to permit reaching equipment or ceilings as high as 22-23 ft. No connection to an electric outlet is required. The telescoping tower is easily rolled anywhere and locked in the working position.

The unit has a capacity of 400 lb and weighs approximately 600 lb. The work platform is elevated through extension of a hydraulic ram, with the hydraulic pump operated by a battery-powered electric motor.



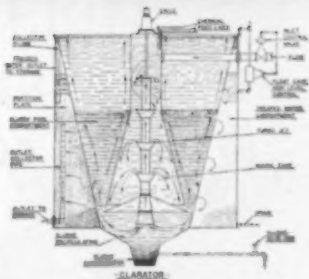
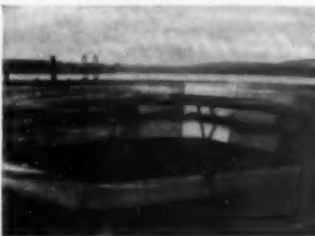
FOR CLARIFICATION, STABILIZATION NEUTRALIZATION, CHLORINATION PURIFICATION, ALKALINITY REDUCTION SOFTENING, SILICA REMOVAL, IRON REMOVAL, CONTROLLED CONDITIONING

The Belco CLARATOR

Advantages:

1. RAPID CHEMICAL SLUDGE CONTACT
2. SIMPLICITY OF OPERATION
3. VARIABLE OUTLET FLOW
4. SEPARATE STORAGE COMPARTMENT
5. COMPACT
6. AUTOMATIC CONTROL
7. LOW TURBIDITY

Looking into Belco Clarator



Essential Components of the Clarator:

1. Raw water inlet pipe
2. Automatic Desludger
3. Central mixing compartment
4. Overflow flumes
5. Turbo-Jets
6. Sludge concentrator
7. Treated water compartment
8. Axial flow slurry recirculation pump

The Belco Clarator is designed to handle all types of water treating problems. Essentially the process design of the Clarator and unit operation is identical for all problems. The differences lie in the type and quantities of chemicals used to achieve a definite treated liquid effluent. The raw water enters the mixing compartment at the top of the Clarator with automatically fed dosages of chemicals so that chemical reaction takes place immediately. Slurry particles rapidly grow in size

by accretion and pass to the slurry compartment. The treated water flows around the perimeter of the tank to the outlet. Heavy particles of sludge collect and settle at the bottom of the concentrator where it is automatically discharged.

Complete description and color illustrations in Bulletin 108. Ask for your copy.

Belco engineers are prepared to give you authoritative assistance and close cooperation on all water treatment problems.

Belco

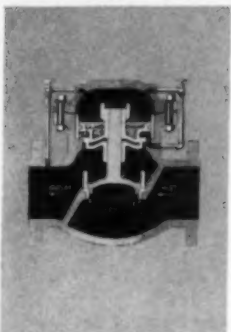
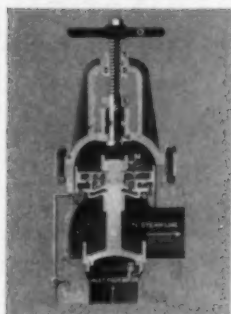
BELCO INDUSTRIAL EQUIPMENT DIVISION, INC.

PATERSON 3, NEW JERSEY

Processes for Removal of Water Impurities

Belco Clarator installed in New York City for clarifying East River water.





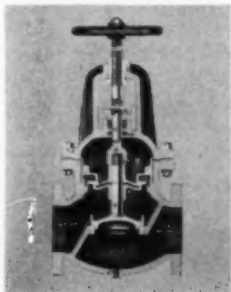
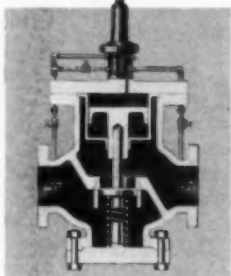
Reading from top to bottom:

G-A double-cushioned single-acting non-return valve, angle pattern.

G-A double-cushioned check valve, globe pattern.

G-A cushioned unloading valve, globe pattern.

G-A combined throttle and automatic engine stop valve, globe pattern.



Your best

PROTECTION

against sudden shock,
"hammer" and costly damage



GOLDEN-ANDERSON

Automatic
Cushioned
Steam plant

VALVES

Golden-Anderson Valves have proven efficiency, quality and dependability for over 35 years in the tough applications put to them by America's industrial and power plants. The cushioning arrangement in all G-A valves permits them to operate smoothly at all times.

Golden-Anderson designs and builds over 1500 types and sizes of valves for engineered protection and high pressure installations. Let our experienced engineers help you on your next valve problem.

GOLDEN-ANDERSON
Valve Specialty Company

2073 KEENAN BUILDING • PITTSBURGH 22, PA.

Non-Melting Waxes

F-30

FLEXROCK COMPANY, Filbert and Cuthbert, W of 36th St., Philadelphia 4, Pa.,

has developed a series of new non-melting waxes. According to the manufacturer, even if heated to the combustion point these waxes will not melt. Such waxes as paraffin, petrolatum, japan wax, beef tallow, beeswax, candelilla, carnauba, ouricuri and others have been specially processed to give them this extraordinary property. Slightly harder than the unprocessed wax, the non-melting waxes have a higher softening point—but they never reach the melting stage. Solubility of the waxes is unaltered.

Although the full extent of the applications of the non-melting waxes have not been determined, the manufacturer states that they should be considered wherever waxes are specified for use at elevated temperatures.

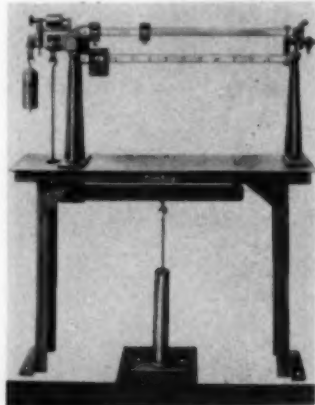
Industrial Scale

F-31

THE YALE & TOWNE MANUFACTURING COMPANY, Philadelphia Division, 11000

Roosevelt Blvd., Philadelphia 15, Pa., has developed a new platform beam scale designed for fast, accurate, low-cost, industrial weighing applications.

The lever system in the platform is all-steel as are other key parts. Poises on the main bar are mounted on roller bearings for rapid positioning. Other features of the new scale include a 100 per cent end loading platform that gives the same reading regardless of the location of the load on the platform. The manufacturer states that the platform, which is mounted on outboard bearings, also absorbs the shock of moving loads without damage to the scale, and it will not tip.



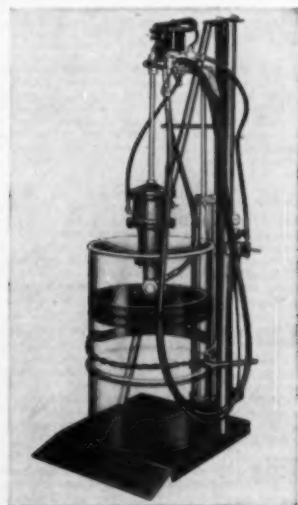
Pit requirements for the new model are only 11-in., saving considerable expenditure on excavation when the scale is installed. Available in self-contained and semi-self-contained models, the scale is built in capacities up to 6,400 lb. Platforms range from 46 x 38 to 76 x 54 in.

Forced Induction Pump with Elevator

F-32

LINCOLN ENGINEERING COMPANY, 5702-24 Natural Bridge Ave., St. Louis 20, Mo., has announced a new hydraulically operated, single Air Ram Elevator for use with their heavy duty, air-motor operated drum pumps. The manufacturer claims that the unit will exert 7,110 lb pressure on material and will completely empty and clean sides of 400 lb or 55 gal drums.

The unit consists of the Air Ram with three-position control valve for raising, lowering, or holding pump and follower assembly in desired position. Air regulator with gauge controls air pressure required for forcing pump and follower assembly against material. Solenoid valve, actuated by micro-switch attached to control valve on material delivery hose, admits air to the pump permitting operation of pump only when material is being delivered. Automatic follower vent breaks seal between double edged sealing member of follower assembly and material when elevator is raised. Built-in chain with toggle clamp holds drum in position on elevator platform.



You Get Trustworthy Liquid or Gas Cooling With Great Cooling Water Savings from the **NIAGARA AERO HEAT EXCHANGER**

● You can cool air, gas, water, oils, chemicals, electric and power and process equipment, engines, mechanical processes with lower cost and really accurate control of temperature with the Niagara Aero Heat Exchanger.

You are assured of uniform, constant production and quality from any process . . . steady, reliable operation . . . lower cost for more dependable cooling. You can have closed system cooling with freedom from scale, dirt, corrosion and maintenance troubles. You can accurately cool more than one type of liquid with one machine.

The Niagara Aero Heat Exchanger uses atmospheric air to cool liquids and gases by evaporative cooling. You can remove heat at the rate of input to keep accurate control of gas or liquid temperature. You can put heat back into the system to save the losses of a "warm-up" period or to equalize the effect of load variations.



Great savings in cooling water and savings in piping, pumping and power return the cost to you quickly. The Niagara Aero Heat Exchanger can save you approximately 95% of your cooling water cost. Write for Bulletin 96.

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. SP, 405 Lexington Ave.

New York 17, N. Y.

Experienced District Engineers in all Principal Cities

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- in Quality
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PEROLIN FUEL OIL TREATMENT.....for Soot and Sludge

PEROLIN BOILER TREATMENT...for Scale and Corrosion Control

PERO-NITE.....Soot and Fire Scale Remover

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and many other maintenance products

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Catalogs

(Continued from p. 18)

For more data circle item code number on the postage free post card—p. 17

B-10 FEEDWATER TREATMENT—File No. SM-5929, 16 pages—"Treatment of Water for Boilers" describes the methods of applying treating chemicals to boiler feed-water systems and boiler drums. Illustrated with flowgrams showing various methods.—**PROPORTIONERS, INC.**, P. O. Box 1442, Providence 1, R. I.

B-11 VALVES—Valve Price List, 8 pages Contains information on sizes, materials of construction, and prices of the company's line of valves, including bronze valves and cocks, iron valves and cocks, iron and brass unions, expansion and swing joints.—**JARECKI VALVE DIVISION, H. K. PORTER COMPANY, INC.**, Drawer 2650, Tulsa, Okla.

B-12 COMBUSTION CONTROL—4 Bulletins, Case Histories—Each report discusses experience of one company with combustion control. Schematic drawing and photographs included with each. Selector Guide also available.—**THE HAYS CORPORATION**, Michigan City, Ind.

B-13 GAS BURNERS—Bulletin, 4 pages —"Luminous Flame Draft Type Burners for L.F.G. & Natural Gas" are catalogued with specifications and prices.—**FAUCHER GAS BURNER CO.**, P. O. Box 973 SS, Fort Worth 9, Texas.

B-14 AIR CONDITIONING—Booklet B-5160, 20 pages—"A Planning Guide for Industrial Air Conditioning" gives helpful technical information reduced to understandable terms. Illustrations of each kind of equipment described are included.—**WESTINGHOUSE ELECTRIC CORPORATION**, Sturtevant Division, 290 Roadville St., Hyde Park, Boston 24, Mass.

B-15 MAGNETIC CONVEYOR—Bulletin No. 552, 4 pages—New principles in conveying skip, plate, sheet, rod, bar, pipe and shapes through the installation of Magnetic Conveyor elements are illustrated and explained. — **ERIEZ MANUFACTURING COMPANY**, Erie, Pa.

B-16 SOLVENT DETERGENTS—Booklet, 24 pages—Describes the advantages provided by solvent detergents in effecting economical removal of carbon, grease, dirt and paint from metal surfaces. Illustrated.—**OAKITE PRODUCTS, INC.**, 132A Thames St., New York 6, N. Y.

B-17 ELECTRIC CABLE HOISTS—Catalog, 6 pages—Describes Bob-Cat heavy duty electric cable hoists. Illustrated with photographs, line drawings of various types of suspensions and cutaway view of the hoist.—**OHIO HOIST & MFG. CO.**, Broadway and Henry Streets, Cleveland 5, Ohio.

B-18 BLOWER—Publication No. 21, 6 pages—Gives dimensional information including engineering layout, typical application data, important design data, blower number, rating—cfm at listed rpm, for the Standardaire Blower. Illustrated.—**THE STANDARD STOKER COMPANY, INC.**, 370 Lexington Ave., New York 17, N. Y.

B-19 INDUSTRIAL LIGHTING—Bulletin LD-4, 47 pages—"Planned Lighting for Industry" incorporates new material prepared by the company's illuminating engineers. Outlines benefits of good industrial lighting and discusses six principal lighting systems. Illustrated.—**GENERAL ELECTRIC LAMP DEPARTMENT**, Attn.: Inquiry Bureau, Nela Park, Cleveland 12, Ohio.

B-20 STAINLESS TUBING—Technical Bulletin 19, 4 pages—Data for engineers associated with design, fabrication.

and application of stainless tubing, includes analyses, oxidation resistance, thermal treatment and mechanical, electrical and physical properties of ten austenitic and ferritic stainless tubing steels.—THE BABCOCK & WILCOX TUBE COMPANY, Beaver Falls, Pa.

B-21 PIPE LINE FILTERS — Bulletin B-1A, 4 pages—Describes, illustrates, and gives applications and specifications for 75 filters, including pressure and vacuum types for air and other gases. Includes installation photographs.—DOLLINGER CORPORATION, 11 Centre Park, Rochester 3, N. Y.

B-22 FLEXIBLE COUPLINGS — Folder No. 2343, 4 pages—Contains engineering information for proper application of roller chain flexible shaft couplings, including dimensions, weights, service factors, and horse power ratings. Detailed data on two types of protective grease-retaining casings.—LINK-BELT COMPANY, 807 N. Michigan Ave., Chicago 1, Ill.

B-23 NON-RETURN VALVE — Bulletin B-2, 2 pages—Illustrates and describes the company's cushioned single-acting non-return valve. Take assemblies on the elbow, angle and globe bodies are pictured, with complete list of parts. Tables show general dimensions, approximate shipping weight, and list of materials.—GOLDEN-ANDERSON VALVE SPECIALTY CO., 2073 Keenan Bldg., Pittsburgh 22, Pa.

B-24 COAL HANDLING EQUIPMENT — Bulletin No. 162, 20 pages—Describes modern central station coal handling practices in recent installations; illustrates individual units of equipment, including diagrams, dimensional drawings, and photographs.—THE C. O. BARTLETT & SNOW COMPANY, 6200 Harvard Ave., Cleveland 5, Ohio.

B-25 COAL PREPARATION — Bulletin, 3 pages—Discusses coal preparation for power plants. Describes coal crushers and pulverizers and explains how coal is split, not crushed, by the company's Rolling Ring Principle. Illustrated.—AMERICAN PULVERIZER COMPANY, 1243 Macklind Ave., St. Louis 10, Mo.

B-26 FORK LIFT TRUCKS — Bulletin No. 77, 6 pages—Illustrates and describes the company's line of heavy-duty fork lift trucks in 5, 7½, and 10-ton capacities. Application photographs, line drawings showing construction and operation, and table of specifications are included.—SILENT HOIST & CRAN CO., 841-877 Sixty-Third St., Brooklyn 29, N. Y.

B-27 COMBUSTION CONTROL — Catalog, 13 pages—Includes information, description, specifications, and photographs of combustion instruments and controls—electric damper controls and gages, the new Master Regulator, and the Model BC-B steam control.—CLEVELAND FUEL EQUIPMENT CO., 7316 Associate Ave., Cleveland 9, Ohio.

B-28 ZEOLITE SOFTENER — Publication 4520—"Cochrane Zeolite Softeners featuring the Cochrane Hydromatic Single Control Valve" explains sodium zeolite softening process and gives data necessary for laying out a zeolite water softening plant, size of equipment, and selection of zeolite material.—COCHRANE CORPORATION, 17th St. below Allegheny Ave., Philadelphia 22, Pa.

B-29 SPACE HEATERS — Bulletin 526, 8 pages—Describes direct fired space heaters in a range of gas or oil fired models with outputs from 400,000 to 2,000,000 Btu per hour. Discusses reduction of steel needs for heating systems through use of direct-fired warm air heaters.—DRAVO CORPORATION, Heating Dept., 5th and Liberty Aves., Pittsburgh 22, Pa.

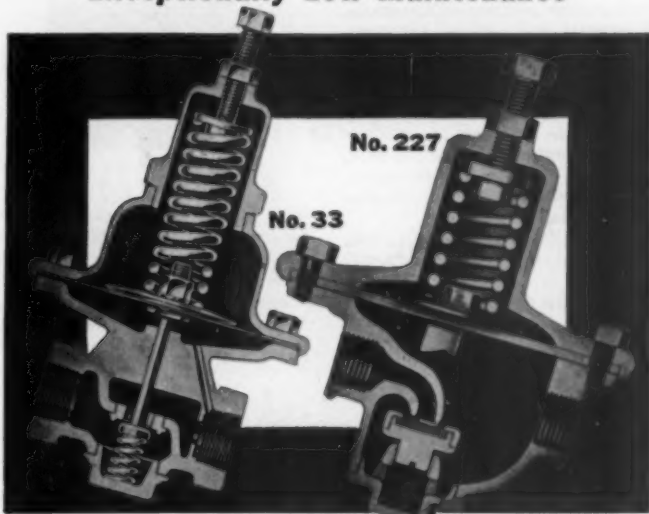
B-30 INDUSTRIAL COOLER — Bulletin 1020, 20 pages—Illustrates and describes a new design of oil and water cooler which uses helically-finned heat transfer elements instead of conventional bare tubes. Gives selection data and explains operation.—THE GRISCOM-RUSSELL CO., 285 Madison Ave., New York 17, N. Y.



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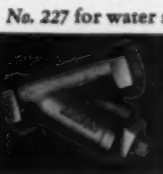
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NEWS for Southern Industry

Betz Engineering—Hilliard and Warren Pump in Mid-South Area

BETZ ENGINEERING SALES COMPANY, headed by ALLEN W. BETZ, 1225 Magazine St., NEW ORLEANS 13, LOUISIANA, has been appointed to represent THE HILLIARD CORPORATION, Elmira, N. Y., in the territory of LOUISIANA, MISSISSIPPI, and southern ARKANSAS. They will act as agents for the full line of Hilliard-Hilco lubricating, filters, reclaimers and purifiers.

The Betz organization has also been appointed to represent the WARREN STEAM PUMP COMPANY, INC., Warren, Mass., in LOUISIANA, MISSISSIPPI, ALABAMA with sections of FLORIDA and ARKANSAS.

Allen W. Betz, who heads the Betz organization, is a graduate of Tulane University in Chemical Engineering and was first employed by Freeport Sulphur Company at Port Sulphur, La. In 1939 he joined Gulf Engineering Company, New Orleans, as a Sales and Chemical Engineer. Two years



Allen W. Betz

later he went with Barada & Page, Inc., handling industrial chemicals and becoming Assistant Branch Manager. Mr. Betz returned to Gulf Engineering Company in 1943 as Sales Engineer and later as Manager of Industrial Sales, a position held until he resigned early this year to establish his own business.

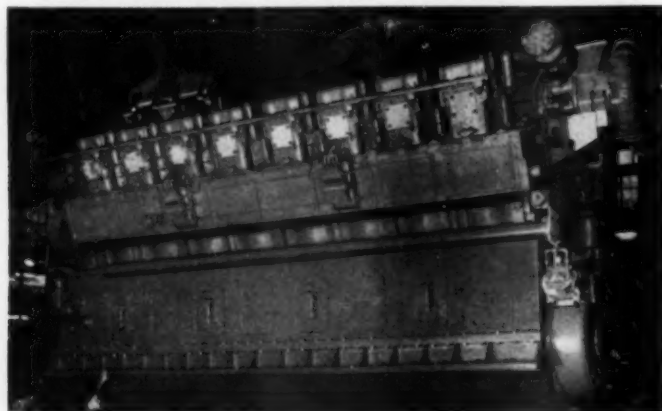
Power for Reynolds Metals Aluminum Plant—Corpus Christi

The \$80 million Corpus Christi, Texas, operation of Reynolds Metals will have the capacity to produce 150,000,000 lb of aluminum pig annually. Scheduled for completion the early part of 1952, the power plants for this

new aluminum reduction project will comprise the largest electric-generating project ever to be powered by internal combustion engines.

The Cooper-Bessemer Corporation will build 40 of its largest, most modern supercharged gas engines for the plant. This is the biggest single commercial engine order ever to be re-

ceived by this 118-year-old engine builder and calls for the fastest possible construction of 3700 hp, Type LSV-16-SG engines.



American Coolair Promotes Weeks

AMERICAN COOLAIR CORPORATION, with headquarters in JACKSONVILLE, FLORIDA, is "mobilizing for defense" through an expanded training program that is being directed by the company's newly-elected vice president, GEORGE E. WEEKS.

Object of the program is to familiarize dealers and distributors throughout the nation with applications of the company's products in connection with the national defense program.

Announcement of Mr. Weeks' promotion to vice president was made by J. E. GRAVES, JR., president of American Coolair Corporation. Mr. Weeks has been sales manager of the company since 1944 and a director for the past five years.

Other officers and directors of American Coolair Corporation include W. W. ALLEN, chairman of the board, and W. W. ALLEN, JR., secretary and production manager. MR. KURT SPRENGLING is assistant sales manager.

ceived by this 118-year-old engine builder and calls for the fastest possible construction of 3700 hp, Type LSV-16-SG engines.

Natural gas for fuel will be furnished from nearby independent fields. When the completed power plant is in full operation, natural gas fuel will be drawn at a rate of 48 million cu ft per day, giving some idea of the size of this one operation alone.

As a result of the supercharged gas engine development, pioneered by Cooper-Bessemer, it has become possible to boost gas engine horsepower output 80 per cent while cutting fuel consumption as much as 30 per cent. Keeping in mind the vast quantities of natural gas to be consumed as fuel on this one power generating operation, the enormous savings in our natural resources effected by Cooper-Bessemer's successful supercharging developments become obvious.

In the powering operation for this plant's needs, 9 of the LSV-16-SG units will drive 2500 kw, alternating current generators furnishing current at 4160 volts, 3 phase and 60 cycle. Thirty-one units will operate 2500 kw, direct current electrolytic reduction generators furnishing 3450 amperes at 725 volts nominal rating.

A. O. Smith Corp.—Houston

A. O. SMITH CORP., Milwaukee, Wis., has named C. R. RIGBY group executive in charge of the company's HOUSTON, TEXAS, plant. The Houston Works manufactures pressure vessels, liquefied petroleum gas systems and vertical turbine pumps.

F. B. DUNN, former manager of the Houston plant, was placed in charge of personnel for both the Houston Works and the company's entire southwest district administrative area.

Sylvania Electric Products—West Virginia

SYLVANIA ELECTRIC PRODUCTS, INC., Ipswich, Mass., has purchased the Continental Can Company building at WHEELING, W. VA., for the manufacture of fluorescent lighting fixtures.

Wheeling is the second Sylvania Plant location in WEST VIRGINIA. The first, established at HUNTINGTON in 1944, produced special radio tubes and electrical equipment.

Ward Leonard Electric Co.—Kansas City

WARD LEONARD ELECTRIC CO., 115 Mac Quisten Parkway South, Mount Vernon, N. Y., has announced the appointment of MAURY E. BETTIS CO., 3319 Gillham Road, KANSAS CITY 3, Mo., as industrial and electronic sales representative for the Kansas City area.

FUTURE EVENTS

Of Engineering Interest

NATIONAL MATERIALS HANDLING EXPOSITION, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.
April 30-May 4, Fourth Annual Exposition, International Amphitheatre, Chicago, Ill.

SOUTHWEST AREA CONFERENCE ON INDUSTRIAL RELATIONS, John O. Flanagan, Gen. Chmn., United Gas Corp., United Gas Bldg., Texas Ave., Houston, Texas.
May 4-5, Conference, Rice Hotel, Houston, Texas.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, C. E. Davies, Sec'y, 29 West 35th St., New York, N. Y.
June 25-29, Oil and Gas Power Division Conference, Baker Hotel, Dallas, Texas.

NATIONAL ASSOCIATION OF POWER ENGINEERS, INC., A. F. Thompson, Dir. of Exhibits, Suite 1050, 176 West Adams St., Chicago 3, Ill.
Aug. 21-23, Golden Anniversary National Power Show, Hotel Plaza, San Antonio, Texas.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, C. E. Davies, Sec'y, 29 West 35th St., New York, N. Y.
Sept. 10-14, Industrial Instruments and Regulators Division and Instrument Society of America Exhibit and Joint Conference, Houston, Texas.
Sept. 24-26, Petroleum Mechanical Engineering Conference, Hotel Mayo, Tulsa, Okla.

Oct. 11-12, Fuels and AIME Coal Divisions Joint Conference, Hotel Roanoke, Roanoke, Va.

Nov. 25-30, Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Billings & Spencer—Southwest

C. A. WAGNER, with headquarters in DALLAS, has been appointed by THE BILLINGS & SPENCER COMPANY, Hartford, Connecticut, manufacturer of drop forged wrenches and shop tools as their direct representative for TEXAS, ARKANSAS, LOUISIANA and OKLAHOMA.

Owens-Corning—S.C.

Appointment of GEORGE S. MCELROY as project manager for OWENS-CORNING FIBERGLAS CORPORATION's new

Fiberglas yarn plant in ANDERSON, SOUTH CAROLINA, was announced recently by JOHN H. THOMAS, vice president and general manager of the company's Textile Products Division.

Mr. McElroy is directing the building and equipping of Owens-Corning's new Anderson plant, as well as supervising training of future key plant personnel.

Since joining Owens-Corning in January, 1946, Mr. McElroy has done extensive technical research work to develop and refine processes for producing Fiberglas yarns. Prior to his

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new appointment, he had spent two years in the company's Fiber Forming Laboratory in Newark and a like period in the Textile Processing Laboratory in Ashton, R. I.

Hawkins-Hamilton—North Carolina

THE HAWKINS-HAMILTON CO., American Bldg., RICHMOND, VIRGINIA, has announced the opening of an office in CHARLOTTE, NORTH CAROLINA. Mr. W. L. HAWKINS is in charge of the new office, which is located in the Independence Building.

The Hawkins-Hamilton Co. are representatives of ANDALE COMPANY, NORTHERN EQUIPMENT COMPANY, TERRY STEAM TURBINE COMPANY, and VULCAN SOOT BLOWER CORPORATION in North Carolina.

Oglesby and Vann—Southern Research Institute

SOUTHERN RESEARCH INSTITUTE, 917 South 20th St., BIRMINGHAM 5, ALABAMA, has announced that SABERT OGLESBY, JR., has rejoined its Engineering Division after an absence of several years which he spent as an instructor and obtaining his M.S. degree in Electrical Engineering at Purdue University.

ROBERT W. VANN, B. S., University of Alabama, Mechanical Engineering, has joined the Engineering Division. Mr. Vann was formerly with the Continental Gin Company.

Minneapolis-Honeywell Adds to Field Staff

The following were included in MINNEAPOLIS-HONEYWELL REGULATOR COMPANY's additions to the field staff of its BROWN INSTRUMENTS DIVISION: WILLIAM R. COFFMAN, KANSAS CITY; CYRAL L. GRIESBAUM, ST. LOUIS; PAUL E. MCKENZIE, LOUISVILLE; HARRY F. OGDEN, DALLAS; WILLIAM S. STROUD, KNOXVILLE; LOUIS D. GERCKEN, CHARLOTTE; HARRY L. KAY, RICHMOND; and JOHN R. MORRISON, GREENVILLE.

Homestead Valve Representative

SHEFFLER-GROSS COMPANY, Drexel Bldg., Philadelphia, has assumed the account of the HOMESTEAD VALVE COMPANY of Coraopolis, Pa.

Southern Coal Elects Kelce

SOUTHERN COAL COMPANY, INC., Chicago, has announced the election of TED L. KELCE as Executive Vice President of the company. Mr. Kelce has established headquarters at the company's general office, 333 North Michigan Ave., Chicago.

Kelley to Represent Air Preheater in Southeast

BENJAMIN S. KELLEY has been appointed sales engineer to represent AIR PREHEATER CORPORATION in GEORGIA, FLORIDA, and NORTH and SOUTH CAROLINA. Mr. Kelley's headquarters will be in ATLANTA, GA.



Benjamin S. Kelley

Associated with Air Preheater for the past ten years, most recently in the Chicago office, Mr. Kelley has had experience in the engineering, service, and sales departments. He is an alumnus of Cornell University, and is a junior member of the American Society of Mechanical Engineers.

New Cleco Distributor

THE CLECO DIVISION of the REED ROLLER BIT COMPANY, HOUSTON, TEXAS, has announced the appointment of EQUIPMENT SALES COMPANY, 720 South 19th Avenue, Phoenix, Arizona, as distributors of Cleco Products in that area. The Cleco line includes tools for construction, manufacturing, metal fabrication, foundries, industrial maintenance and stone carving.

Parker Appliance—Dallas

M. L. SHEEHAN has joined THE PARKER APPLIANCE COMPANY, Cleveland, as industrial sales engineer representing the company in DALLAS, TEXAS.

Sheehan will serve industrial firms of the south central states in the application engineering of Parker tube fittings, valves, O-rings, and other products for industrial hydraulics, instrumentation, and fluid handling.

Federated Buildings—Houston

FEDERATED METALS DIVISION, AMERICAN SMELTING AND REFINING COMPANY, recently completed a new office building at 9000 Market Street Road, HOUSTON, TEXAS. The building is being utilized by the company's local administrative personnel.

Federated Metals produces and stocks a wide variety of metals and alloys at Houston. Included are type metals, solders, die casting alloy, brass and bronze ingot metals, zinc dust for industrial users, lead products for the chemical and plumbing industries, and babbitt metals for bearings.

Winder Aircraft Supplying B-29 Parts

THE WINDER AIRCRAFT CORPORATION of WINDER, GEORGIA, recently finished 18 contracts for the armed services. These contracts have all been initiated and completed since July of last year when Winder became the company's home office.

In line with the accelerated aircraft program, the company is also supplying airplane parts to such companies as Boeing Airplane Co., Douglas Aircraft Co., North American Aviation, Inc., and the B-29 modification program being carried on by Grand Central at its Tucson, Arizona, base. Purchase orders from these firms call for re-conditioned and reprocessed B-29 parts.

Exide Conference—Kansas City

Executives from THE ELECTRIC STORAGE BATTERY COMPANY's plants in various sections of the United States and Canada recently held a four-day conference in KANSAS CITY, Mo., to exchange ideas on new production methods and plant management problems.

CARL F. NORBERG, executive vice president of the company, and RAYMOND R. RIELING, superintendent of the company's Kansas City plant, welcomed those attending the conference. Among the topics discussed were central production planning, new and improved production techniques, plant operation and materials handling. Company plant executives who spoke included P. J. HALSALL, MEMPHIS; J. N. SKODA, DALLAS; and C. H. ANGSTADT, ATLANTA. The conference program included a tour of the local Exide battery plant followed by a discussion and question period.

Foxboro Knoxville Office

A new branch office of THE FOXBORO COMPANY has been opened at 618 W. Church Avenue, KNOXVILLE 16, TENNESSEE. MARVIN L. CLEATON, JR., formerly in charge of the company's office at Columbus, Ohio, has been transferred to become Branch Manager at Knoxville. Until now, manufacturers in the Knoxville area have been served by the Foxboro office in Atlanta.

Westinghouse Lamp Warehouse—Texas

Purchase of 3½ acres in FARMERS BRANCH, TEXAS, which is near DALLAS, for construction of a warehouse light bulb has been announced by FRANK C. CLINE, manager of the Southwestern District, WESTINGHOUSE LAMP DIVISION.

The warehouse site is in an area of modern light industrial plants—11 miles north of downtown Dallas, and alongside U. S. Route 77 and tracks of the Missouri-Kansas-Texas Railroad Company.

The new building will provide 29,000 sq. ft. of floor area and will have enclosed railroad siding and truck loading platforms. Completion is scheduled for summer of 1951.

It is the second major Westinghouse construction project announced in Texas within the last few months. Construction of a new light bulb manufacturing plant in PARIS, TEX., now is underway.

Cutler Hammer—Charlotte

Opening of a sales office at 120 East Third Street, CHARLOTTE, NORTH CAROLINA is announced by CUTLER-HAMMER, INC., electrical manufac-

turers, Milwaukee, Wisconsin. The new office will be operated as a branch of the company's ATLANTA district sales office and will be staffed by FRANK A. MILLER, JR., and C. LEE SHAW.

Rodney F. Lauer—York Corp. V. P.

RODNEY F. LAUER, a pioneer in the development of high altitude chambers and all-weather rooms for the Armed Forces, has been named Vice-President in charge of Engineering and Research by YORK CORPORATION of York, Pa.

Mr. Lauer, who has been with the air conditioning and refrigeration firm since he received his degree in Mechanical Engineering at Cornell University in 1930, had been managing York's Pacific District since 1944.

Koppers To Build Texas Plant

KOPPERS COMPANY, INC., has announced a multi-million dollar program of expansion for its Chemical Division which provides for construction of a new plant near PORT ARTHUR, TEXAS.

Koppers has contracted to purchase approximately 1,000 acres of land, located about 2 miles west of Port

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Arthur, Texas. On a portion of this land, the company will construct a plant which will take ethylene from the unit which Gulf Oil recently announced it will build at its Port Arthur refinery and combine it with benzene to make ethyl-benzene. Ethyl-benzene is used as an intermediate in making styrene, which, in turn, is basic to making synthetic rubber and polystyrene.

The new Texas installation will be called the Williams plant in honor of J. P. William, Jr., former President and Chairman of Koppers, who now is retired.

Woodward, Ala. Coke Ovens

WOODWARD IRON COMPANY has awarded KOPPERS COMPANY, INC., a contract for the construction of a battery of 30 chemical recovery coke ovens at its WOODWARD, ALABAMA, plant. To be completed as soon as possible, the 30 new ovens will have a carbonizing capacity of 480 tons of coal per day.

Allis-Chalmers Names Georgia Electric

THE GEORGIA ELECTRIC COMPANY, 927 Roosevelt Avenue, Albany, Ga., has been named a dealer for ALLIS-CHALMERS motors, controls, transformers and Texrope drive equipment in 15 southwestern Georgia counties.

The company, established last October, has also been appointed a certified service shop for Allis-Chalmers, motors and controls.

Principles in the firm are J. L. MALONE, manager and partner, and J. F. SMITH and C. P. GRAY, partners.

American Chain & Cable—Atlanta

THE ATLANTA offices of AMERICAN CHAIN & CABLE COMPANY, INC., are now located in a new district office and warehouse building at 1401 Howell Mill Road, N.W., recently erected for the Company.

The following district managers will make their headquarters in the new building: C. A. GOLDSTROHM, American Chain and Pennsylvania Lawn Mower Divisions; J. V. GASSO, R-P&C Valve Division; J. L. FILBERT, Page Steel and Wire Division. R. W. BARNSTOW, territorial representative for the American Cable and Hazard Wire Rope Divisions, will also make his headquarters at the new location. Only wire rope will be carried in the warehouse.

Mutual Chemical—Baltimore

MUTUAL CHEMICAL COMPANY OF AMERICA has announced the comple-

tion of a new chromium chemical plant to increase the production of Sodium Bichromate and other essential chromium compounds. The new plant is located on the BALTIMORE harbor, adjoining facilities constructed previously.

Operations have already commenced in the new plant and are expected to reach progressively higher levels over the next few months. The demand for chromium chemicals has been exceptionally heavy, and, partly as a result of extended Soda Ash strikes in 1950, output of the industry has not been able to meet all demands. New capacity coming into production now is therefore particularly timely and will be most helpful in assuring adequate supplies of chromium chemicals.

Applebaum Heads Cochrane Division

COCHRANE CORPORATION, Philadelphia, Pa., manufacturer of water conditioning equipment and steam specialties, has announced the appointment of S. B. APPLEBAUM as manager of its Water Treatment Division. Applebaum, who has specialized in water conditioning for more than 35 years, joined Cochrane in 1949, since which time he has been manager of the Cold Process section of the Water Treatment Division. He was founder and is Vice-president of Liquid Conditioning Corporation, now a subsidiary of the Cochrane Corporation.

Texas Eastern Transmission's Pipe Line

Construction work on TEXAS EASTERN TRANSMISSION CORPORATION's new 791-mile pipe line, which was authorized by the Federal Power Commission, is underway.

The new pipe line, 30-in. in diameter, will increase Texas Eastern's peak day delivery capacity from 740,000,000 to 1,205,700,000 cu ft of natural gas.

Aerial surveys of the pipe line route have been completed and ground surveying and acquisition of right-of-way have begun. First shipments of steel pipe have already been received, and the entire project is scheduled for completion in time for service in the winter of 1951-52.

Texas Eastern's new line will extend from KOSCIUSKO, MISSISSIPPI through northwestern ALABAMA, TENNESSEE, KENTUCKY and southeastern Ohio to Connellsville, Pennsylvania, where it will join the existing Inch Lines. From Connellsville a new pipe line will be built to Texas Eastern's and New York State Natural Gas

Corporation's new jointly-owned 105-billion cu ft Oakford Gas Storage Field.

Seven compressor stations will be built on the new pipe line and six stations will be added to the present Texas Eastern System east of Connellsville. These stations, aggregating 98,900 hp, will increase the gas-pumping power of the entire system to a total of 376,300 hp.

In addition to the New England area, the enlarged Texas Eastern system will provide additional supplies of natural gas in New Jersey, Pennsylvania, West Virginia, Ohio and Missouri.

Worthington-Gamon Meter Co. Division of Worthington Corp.

WORTHINGTON-GAMON METER COMPANY, Newark, N. J., formerly a subsidiary of WORTHINGTON PUMP AND MACHINERY CORPORATION, has been made a division of that corporation. The new division will continue the manufacture of liquid meters at the Newark plant.

ROBERT R. ANDERSON, formerly president, Worthington-Gamon Meter Company, has been elected vice-president of Worthington Pump and Machinery Corporation and will act as general manager of the new division.

WILLIAM C. FLANDERS, formerly vice-president of the meter company, has been appointed assistant general manager of the division and WALTER H. ZEIS, formerly secretary and treasurer of the meter company, has been elected assistant secretary of the Worthington corporation.

Alexander Brothers and Charlotte Leather Belting Company Acquired By New Corporation

ALEXANDER BROTHERS BELTING COMPANY, a newly formed Pennsylvania corporation, has purchased ALEXANDER BROTHERS, Philadelphia, Pa., and CHARLOTTE LEATHER BELTING COMPANY, CHARLOTTE, NORTH CAROLINA, from Armour and Company, with the exception of the Curried Leather Department, which will continue to be operated by ARMOUR LEATHER COMPANY, Division of Armour and Company.

The new Company will operate as ALEXANDER BROTHERS BELTING COMPANY and CHARLOTTE LEATHER BELTING COMPANY.

Officers and Directors are as follows: G. L. BRYSON, President and General Manager; GEO. L. ABBOTT, Vice-President and Treasurer; EDWARD P. ALEXANDER, Secretary.

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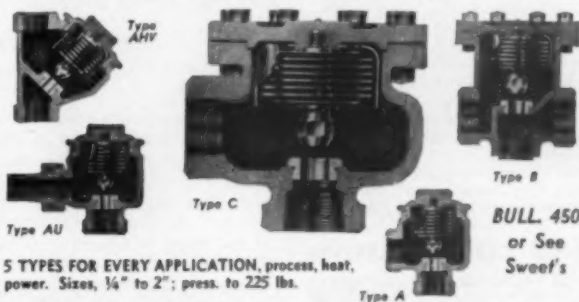
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Symposium on Ultrasonic Testing (STP No. 101)

INTRODUCTION BY H. C. AMTSBERG
PUBLISHED BY AMERICAN SOCIETY FOR
TESTING MATERIALS
1916 Race St., Philadelphia 3, Pa.
140 pages
Price, \$2.00

The ten papers and discussions included in this book represent a summary of the history, theoretical aspects, basic principles of practical testing, and practical applications for the ultrasonic testing of materials as presented at sessions on the subject, at the recent Annual Meetings of the American Society for Testing Materials.

Introduction is by H. C. Amsberg of Westinghouse Electric Corp. Several of the papers include lists of references and one bibliography is outstanding. The latter constitutes 342 references to the inspection, processing, and manufacturing control of metals by ultrasonic methods. This paper by Hastings and Carter is a summary of available technical literature through 1946.

Economic Resources and Policies of The South

BY CALVIN B. HOOVER AND B. U.
RATCHFORD
PUBLISHED BY THE MACMILLAN COMPANY
60 Fifth Ave., New York 11, N. Y.
6 x 9 inches—464 pages
Price, \$5.50

The authors, both well-known economists, give their answers to the following questions: Does the prosperity of the South depend on governmental support of high prices for cotton and tobacco? What is the present stake of the South in international trade? Is the North-South wage differential an asset or liability to the industrialization of the South? What are the trends in Southern population and its composition? How do the changes in per capita income in the South com-

pare with those in the rest of the nation?

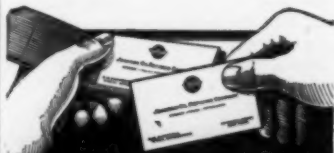
Answers to these and similar questions are given, based on the authors' wide experience in national and international economic affairs and on extensive research recently done for the National Planning Association's Committee of the South.

Data is given on natural resources, banking, public finance, population, farming, labor and wages, manufacturing. The structure of Southern economy is analyzed, and the economic changes of the past two decades are described. The authors analyze policies for the utilization of natural resources, control of major crops, industrialization, and other basic problems.

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By DONALD P. ECKMAN

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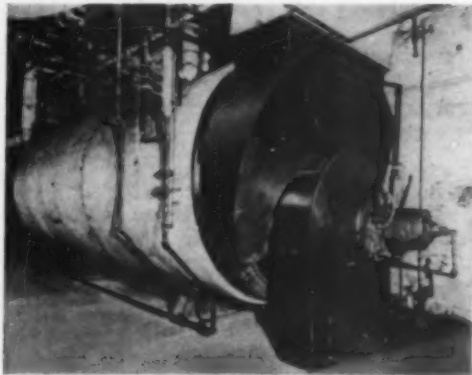
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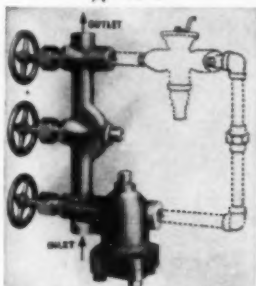
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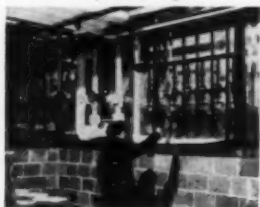
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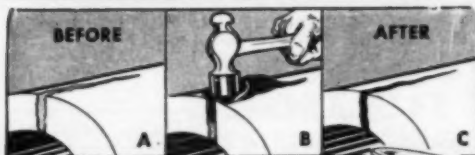
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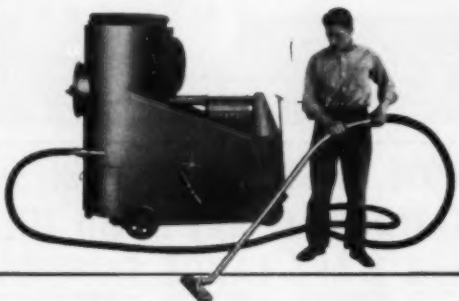
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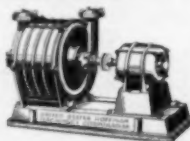
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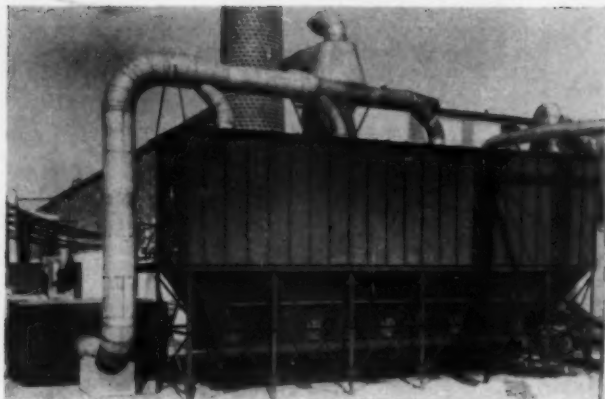
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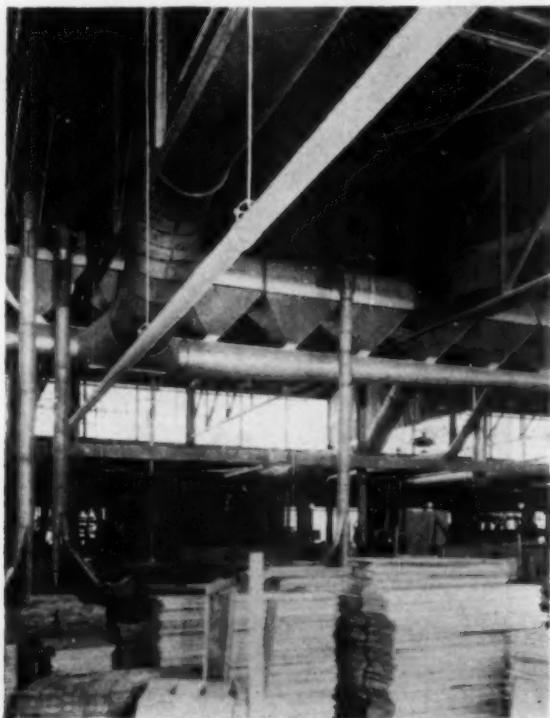
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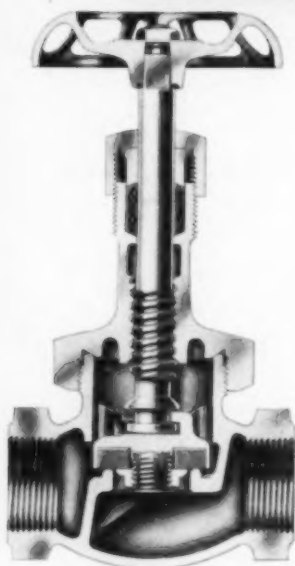


Fig. 506 Bronze Globe
400 lbs. O.W.G. $\frac{1}{4}$ " to 2"



Fig. 507 Bronze Check
400 lbs. O.W.G. $\frac{1}{4}$ " to 2"



Fig. 508 Bronze Angle
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